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ROCKS AND MINERALS

Official Journal of the Rocks and Minerals Association

42

Vol. 21, No. 10

Whole No. 183

A Magazine for Mineralogists, Geologists and Collectors

OCTOBER, 1946

35c

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HUGH A. FORD

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No lists furnished, but enquiries for specific minerals welcomed.

ROCKS and MINERALS

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The official Journal of the Rocks and Minerals Association

CHIPS FROM THE QUARRY

San Diego County—A Great Gem-Bearing Area

San Diego County, California, was at one time the fourth largest gem-bearing area in the world. For many years gems were mined here in wide variety and of superb quality. Tourmalines in all colors, Topaz, Beryl, Garnet and the rare and brilliant Kunzite were cut and sent to the Gem Marts of the World. The names of Mesa Granda, Pala, and Ramona in the vicinity of Old San Diego, were known well, wherever gems were sold. But now nearly a whole new generation has grown up since gem materials, in any great quantity, were mined from San Diego's mighty pegmatite veins—Certainly, many of the readers of *Rocks and Minerals* may know little or nothing about San Diego's proud history of the production of precious and semi-precious stones. Some of the fabulous old mines may one day produce again. — Others are worked out. But be that as it may, it was a fascinating period and one worth knowing about.

Surtshellir Cave of Iceland

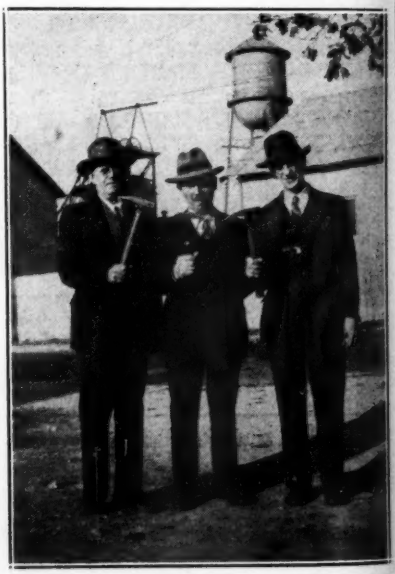
One of the important caves of Iceland is the Surtshellir Cavern in the western part of the island, about 100 miles northeast of Reykjavik (capital, chief seaport, and largest city). The cavern is in lava and is quite large (about one mile long, 36 feet wide, and about 30 feet high); the main entrance is 700 feet long, 40 feet high, and 50 feet wide. The cave is very cold and often contains much ice—in the part called Icicle Cave, the floor is of solid ice—and stalactites and stalagmites of solid ice are present in many parts.

Though the cave is in a very cold, desolate, rocky area, with huge glaciers bordering both sides of the Kaldidalur (ColdValley) which leads to it, it is frequently visited by tourists.

Robinson Moves to Washington

Mr. C. H. Robinson, former president of the Mineralogical Society of the District of Columbia, has moved from Washington, D. C., to Puyallup, Wash. (6231½-16th St., S.W.) where he and Mrs. Robinson will make their future home.

A very friendly, interesting person, and a most active collector—still a young man although he may not admit it—Mr. Robinson will be sorely missed by eastern collectors among whom he has a host of friends. Though the East suffers a heavy loss by his departure, the West naturally gains heavily. Before he even gets settled in the Great Northwest, he joins the Tacoma Agate Club, visits a number of localities in the area, meets many collectors, and otherwise enjoys himself. That is Mr. Robinson!



French Morgan, of Washington, D. C. (left); C. H. Rnbinson (center); and R. L. Sylvester, of Syracuse, N. Y., (right). (1945 Photo).

ROCKS and MINERALS

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MINERAL COLLECTING IN THE OLYMPIC MTS., WASHINGTON

BY TED DANNER

11025 38 N.E. Seattle 55, Wash.

The Olympic Mountains are a rugged mountainous area some 250 square miles in extent forming the major portion of the Olympic Peninsula in the state of Washington. The Olympic Peninsula makes up the northwest corner of the United States. It includes the counties of Clallam, Jefferson, and the northern portions of Grays Harbor and Mason counties. The mountainous portion is included in the Olympic National Park and the Olympic National Forest. It is an area of oustanding natural beauty and curiosity. Here live the magnificent Roosevelt Elk, the Cougar, and numerous other animals some found in one other place in the world. Here lie areas where in less than 40 miles the rainfall varies from 200 to 15 inches. The lower elevations are covered with dense growths of Douglas fir, Hemlock, and Cedar. Few trails traverse the mountains and those that are not kept up are soon obliterated. Large portions are unmapped and some areas are largely unexplored.

The geology of the area is largely unknown. In general the mountainous area is flanked by sediments and volcanic rocks of Tertiary age which rest uncomfortably on greatly indurated sandstones, slates, and other rocks of older unkown age. No fossils have been found in these older rocks though they are quite abundant in the flanking Tertiary sediments. No plutonic rocks are exposed on the peninsula. The mountains seem to have beeen formed as part of an uplift in Upper Miocene time. Complete faulting in the Tertiary rocks and very complex folding and faulting in the older rocks coupled with the climatic conditions make the Olympics a very difficult geologic problem. What little geologic exploration that has been done has been connected with the seepage of oil along the west coast of the peninsula and the numerous manganese prospects that occur in a band around the central mountain core.

The area covered in this article is in the eastern portion of the Olympics. The eastern part of the peninsula is bordered by Hood Canal, a long narrow arm of Puget Sound. Numerous short rivers drain the eastern area of the mountains and build deltas into Hood Canal. Starting at sea level it is less than a twenty mile hike till you are at 6,000 feet in alpine meadows covered with perpetual snow. While working at Camp Parsons, Seattle Area Council Boy Scout Camp on Hood Canal, the author led several groups of Boy Scouts on four and five day hikes into the eastern Olympics. It was on these trips that the mineral occurrences were noted.

Take the Olympic Highway south from the little town of Quilcene till you come to the Quilcene River and then take the road on the north bank, driving into the mountains to the end of the road. Here you will find a forest service lean to known as Bark Shanty. Here you have a choice of two trails, the Quilcene Trail or the Mt. Townsend Trail. If you have a few days to spend in the mountains and are willing to pack in your food and sleeping bag,

take the Mt. Townsend Trail. Follow this trail for five miles and you will come to Sink Lake a small pothole-like lake. It is interesting geologically as it is a lake in the last stage of its existence. It was formerly much larger in extent and now is almost filled with sediment brought into it by Townsend Creek. Here is another leanto shelter. Three and a half miles more brings you into the alpine country and you find yourself going up the long ridge known as Mt. Townsend. The rocks you are walking on are a part of the Metchosin formation, a series of thick basalt flows and pillow lavas containing lenses of limestone and shale. The Metchosin is of lower Eocene Age and of immense thickness forming all exposures from Hood Canal to almost twenty miles inland. As you ascend Mt. Townsend you come to a sign at a fork in the trail. It points south to Silver Lakes about a mile and a half, and since you brought your fishing pole you take this trail. You descend into a little valley and make your way up the valley following the little creek which flows in it. In a short time you arrive at beautiful Silver Lake and make your camp for the night. You try your luck and if it isn't so good here you climb over the rocks to another Silver Lake and here catch your dinner. Then tired after your hike you climb into your sleeping bag and drift off into a sound sleep. Next morning bright and early you get up and eat your breakfast, then continue up the valley a short distance till you come to a little pass and here a great panorama is spread before you. Two thousand feet below is the Quilcene River and far to the south and west stretches an endless sea of snow covered peaks. You set off along the ridge going west, dropping a little in elevation to avoid the knife-like crest. In half a mile you come to another pass with a little valley leading off to the north. This is Tull Canyon and about two miles down valley you see a few shacks and you know you are looking at Tull City, an old mining camp built around 1905. Your mineral searching eyes attract you to the western side of Tull Canyon as there in the almost vertical canyon walls lies a lense of a reddish colored limestone. You know you are in manganese country so you are looking for the red carbonate of manganese, rhodochrosite. As you climb the canyon wall you notice blu-

Tull City, Wash., an old mining camp built about 1905

ish-black colored rocks on the talus draped on the canyon wall. You stop and pick up a piece and then realize that this is manganese ore. You break a few rocks open and you find that this bluish-black mineral in some cases is only a coating and inside is reddish argillite or limestone and sometimes jasper, or manganocalcite. Some pieces contain a yellow to brownish mineral which you later identify as the rare mineral bementite. Other pieces are solid bluish-black and seem to be hausmanite. You forget about the red limestone as the canyon wall was too steep anyway and search the talus for more manganese ore. It is in abundance, some specimens reaching boulder size. You select only the richest looking specimens as you have to pack them on your back. Then you pick out a faint trail and follow it down to the cabins of Tull City. Along the way you see a few whitened logs remnants of what was once a cabin. A rusty frying pan is among the logs almost completely weathered to dust. You continue on and soon reach the four buildings that are called Tull City. You find only two of them in any shape at all, one of them bearing the big word "Hotel" over the doorway. Numerous bottles lie around the cabins, some purple like the bottles in the mining camps of the southwest. You search around for a tunnel but do not find any nor do you find a trace of copper ore for which the place was built. You don't stay here long as the mosquitos descend on you in clouds. You continue down the Valley following Tull Creek for a mile till you come to the Copper Creek trail. You follow it in a southerly direction for half a mile when you come to the abandoned mining camp of Copper City, better known as the Tubal Cain Mine. This camp was built around 1918 and had about a dozen cabins. Most of these were wrecked later by an explosion of dynamite set off by hikers who found some dynamite left in one of the cabins. You climb up a short distance to the tunnel entrance but do not go in very far as you find numerous boulders on the tunnel floor that have dropped from the roof and you find it difficult to wade through the stream of icy water rushing along the tunnel floor. This tunnel was driven 2,300 fect into the mountain side to cut a body of manganese ore but none was found and the mine was shut

Buckhorn Pass, Washington

down. You hunt around on the dump but find only copper-colored limestone and a few pieces of bright green epidote. You continue up the copper creek trail for a mile and a half to a fork in the trail where a sign reads: Buckhorn Lake ½ mile. You stay on the main trail for a short distance till you come to a camping spot as there is no place to camp at Buckhorn Lake. You then back track to the lake for fishing. You spend your second night here. You notice that the rocks are slates and argillites and you realize you have reached the old core of the Olympics. Pieces of impure white milky quartz are common on the nearby slides and an occasional clear quartz crystal awards your search.

You rise early and start up the last mile to Buckhorn Pass feeling happy that this is the last climbing you have to do on the trip. You climb up past massive sandstone and more slate finally arriving at the top where another breathtaking panorama spreads out before you. To the west and immediately below you is the Dungeness river rushing swiftly to the north and its outlet into the Straits of Juan de Fuca. Beyond to the west are more snowcapped mountains and to the south towers the many high crags known as Mt. Constance, the third highest peak in the Olympics, composed of an immense pile of pillow lavas.

The trail continues southward gradually descending in elevation. Search along the trail reveals clear quartz crystals scattered in the loose talus. An occasional outcrop of a conglomerate composed of pebbles about gravel-size embedded in a dark sandy groundmass which turns a rusty red on weathering causes you to wonder where it lies in the geology but its contact is not observed. An occasional rabbit runs across the trail and you stop to pull up an occasional wild onion to chew. In a short while you arrive at Marmot Pass and gaze down the Quilcene valley to the waters of Hood Canal some twenty miles distant. Around the pass you find more quartz as well as white limestone and a bluish gray limestone. You turn sharply when you hear a shrill whistle expecting to greet another hiker only to see in the distance the golden fur of a whistling marmot. Soon more of them pop out of their holes amongst the rocks and whistle at you. You drag out your camera but find you can't get close enough for a good picture. Down you hike for about a mile when you

Looking west across the Dungeness Valley from Buckhorn Pass, Wash.

come to a campsite known as Camp Mystery (It's a mystery why it is called a camp). On you go down the two mile stretch of trail known as pop-out drag. It is dusty and dry and devoid of trees. On a hot day it is not a pleasant stretch of trail to hike up, but you are going down so you don't mind. You travel slowly as you find pieces of hausmannite scattered in the talus on both sides of the trail. Here also is quartz, epidote in bright green hair-like crystals, limestone colored red, white, blue, gray, pink, and green, calcite in white cleavage masses in little veins bordered by epidote, and jasper in solid massive pieces and in orbiculer masses. The jasper is a brilliant red and sometimes you find a piece all of three feet in circumference that makes you wish you had a pack mule along. You must be satisfied with chipping off the brightest fragments as your pack is getting mightly heavy. You hike on down midst meadows covered with vari-colored wild flowers and sweet, juicy, but tiny wild strawberries.

The next seven miles are through forests of towering evergreens with the rushing Quilcene at your side. You stop at different places and with your trusty fishing pole procure your dinner which you will eat that evening at home in Seattle. You finally arrive at Bark Shanty, pile into your automobile and drive down to Quilcene, thence north and east to Port Ludlow where you board a ferry for Edmonds and then south to Seattle and home.

MINERALS ADDED TO YOUR COLLECTION

BEMENTITE:	Yellow to brownish-yellow veinlets and lens-shaped masses with jasper and hausmannite.
CALCITE:	White cleavage masses in vein and filling cracks in basalt.
EPIDOTE:	In green hair like crystals on calcite and on basalt.
HAUSMANNITE.	Bluish-black masses with limestone and argillite.
JASPER:	Red masses sometimes coated with calcite and pyrolusite, sometimes orbicular.
LIMESTONE:	Massive red, gray, bluish, white, pink, gray pieces occurring in lenses in basalt.
MANGANOCALCITE:	White to blackish occurring in hausmannite. Slightly fluorescent under Mineralight Ultra-violet lamp.
QUARTZ:	Clear transparent crystals, white milky crystals. Occurs as loose crystals and in cavities and veins in basalt, sandstone, and slate.

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A Black Future Without R&M

Editor R&M:

I am a very obscure collector but it is hard to express what the magazine means to me. I'd hate to be without *Rock and Minerals* now that I have found it.

Mrs. Bryce Allen,
Tribune, Kans.

Aug. 30, 1946

It's a Treat to Read R&M

Editor R&M:

I have enjoyed *Rocks and Minerals* considerably. My rock hunting and polishing have been quite curtailed during these busy war years but at least it's a treat once each month to read about my hobby.

William F. Veling, M. D.
Detroit, Mich.

Aug. 22, 1946

GREEN GARNETS—UVAROVITES

BY JOHN N. TRAINER

Though the general public commonly expects garnets to be red, three of the six groups of garnets have green varieties, grossularite (calcium-aluminum), andradite (calcium iron) and uvarovite (calcium-chromium). In the grossularite group are the pale green crystals from the Vilui River in Siberia and the massive gray-green "South African Jade," so called, from Buffelsfontein in the Transvaal. The andradite group includes the green topazolite from Piedmond in Italy, the apple-green allochroite from Switzerland, the grass to emerald green gemmy demantoid from the Urals, an apple-green variety from Tilly Foster, N. Y., oil-green from the Graham Mountains in Arizona, brownish and apple-green from Romania, emerald-green from Czechoslovakia. Both these groups more frequently show other colors. The uvarovite garnet, however, is always green and is the most attractive of the green garnets. It was first found in 1832 in Russia and by comparison with the red garnets which were known in Biblical days, it is chronologically a young member of the garnet family.

Chromium sesquioxide is essential in the true uvarovite although it is present in varying percentages in examples from different localities; the theoretical content is 32.52% according to Hintze (1890). Uvarovite has a hardness of 7, a vitreous luster, is transparent and is fine gem material but such stones as have been cut are very small. The crystals average about a tenth of an inch down to drusy coatings on the matrix. Among the largest crystals reported are those by L. J. Spencer (1934) from Outokumpo in Finland. Perhaps some day a fortunate prospector (in California, say) will find crystals large enough to be cut into real gems.

Because of its beautiful emerald green color, uvarovite stands out as a sparkling showy specimen in any garnet collection. There are many minerals associated with uvarovite but the most frequent is chromite followed by serpentine, chlorite, kaemmererite, diopside and calcite.

The common crystal form is dodecahedral with two exceptions known to the writer, namely, the specimens from Eritrea which show the dodecahedron modified by the trapezohedron and those from Jacksonville, California, which show the hexoctahedron modifying the dodecahedron on smaller crystals and rarely vicinal hexoctahedrons.

Uvarovite is considered rare and it was certainly rare down to 1890 when Hintze listed only seven localities and in 1892 when Dana in his *System* listed only eleven. The writer has corresponded with a dozen museums and collectors and with his own collection has compiled a list of over seventy localities in the world and the list is by no means complete, especially in California. The British Museum has sixteen specimens from fourteen localities, the National Museum in Washington has four specimens from three localities, the Harvard collection has seven specimens from seven localities, the American Museum of Natural History has nine specimens from six localities, while the writer has collected twenty-three from sixteen localities. As is generally true with locality lists of minerals, considerable inaccuracy arises from a duplication of names given to the same locality such as Bissersk and Saranovskaya in the Urals where the real locality is Saranovskaya about eight miles from Bissersk. On the other hand, in Siskiyou County, California, only three localities have been mentioned, whereas Clifford Frondel says in a letter to the writer that he recently found uvarovite "abundantly in several" chromite deposits of this county. It would be conservative to say that there are more than seventy uvarovite localities in the world; an estimate which does not indicate scarcity except by comparison with hundreds of

localities where other really fine garnets, especially the red ones, have been found. In the writer's garnet collection, for instance, more than four hundred localities are represented of which only sixteen are uvarovite localities. Moreover, uvarovite, where found, occurs in relatively small quantity but red garnets occur in large quantity, and we would collect green garnets when red garnets of comparable quality would not be considered.

There are many rarer garnet varieties, such as the colorless grossularite from Frugard in Finland, the white and pink crystals from Mexico, the ytteriferous andradite form Romania, the honey-yellow octahedrons from Elba and others with unusual crystal forms and chemical compositions and odd colors. But among garnets, the uvarovites can properly be considered rare.

A study of the garnet literature and of museum and private collections shows that there are three important uvarovite districts, namely, the Urals in Russia, Quebec in Canada and California in the United States.

The Ural specimens come mainly from Saranovskaya near Bissersk in the northern and near Kyshtimsk in the southern Urals and were first reported from the former by Heinrich von Hess in 1832 at a meeting of the Imperial Society of Naturalists in Petersburg (Leningrad) and named for Count Uvarov, the president of the society. At first he thought they were dioptase. They were in fissures and cavities in chromite. The matrix is chromite and an associated mineral is kaemmererite. The chromium oxide content is 38.94% which is higher than the theoretical content. The crystals are about ten to the inch, are dodecahedrons and of a beautiful emerald green. There are more of these Ural uvarovites in museums and private collections than from any other locality except Orford, Canada; at least in American Collections.

T. S. Hunt reported the discovery in 1861 of uvarovite from Orford, Quebec, as small granular and transparent dodecahedrons on calcite and limestone with diopside, millerite and chromite. The chromium oxide content of it is so small, six per cent, that it is essentially grossularite. Millerite and diopside are unusual associates. Since the orignal discovery, uvarovite has been found at six more separate localities in Quebec; Brompton, Buckingham, Coleraine, Hull, Templeton and Wakefield. There are thirty Quebec specimens in the collections studied, twenty-two of which are from Orford.

The first uvarovite from California was reported in 1866 by Professor George J. Brush of Yale University who had received it from a Mr. Clayton of San Francisco. Mr. Clayton said it was from "New Idria" in San Benito County and there is a specimen so labeled in the Brush collection at Yale but there is none in any of the other collections studied. The California Division of Mines has one from "Clear Creek, Idria District" in its Dana collection and reports occurrences at the headwaters of the San Benito River both of which are in the southern part of the county. The writer doubts "New Idria" as the original locality but believes it is safe to assume that it was in the Idria district. Professor Brush describes the mineral as similar to the Ural uvarovite with small emerald green dodecahedrons on chromite associated with kemmererite.

The earliest uvarovite reported in the United States was by Charles U. Shepard in 1861 and was from Wood's chromite mine near Texas, Lancaster County, Pennsylvania. The crystals are from a tenth of an inch down to drusy coatings on chromite, emerald green and scattered through coarsely granular pale green clinochlore inter-mingled with a brownish-gray vermiculite. The writer has a specimen bought from an old collection but up to this writing does not know where there are other specimens.

Other old occurrences are Hanle in Rupshu, Cashmere, India, reported by Tschermak in 1865 and Jordansmuhl in Silesia, Germany, reported by Paul Klein in 1878.

World War II and the search for strategic minerals, especially, chromium, has resulted in the discovery of many new uvarovite localities; in California for instance, the writer has, with the aid of Professors Adolph Pabst, Joseph Murdock and others, listed over thirty, many of them recent. The aversion of the gold prospectors to telling where their strikes were located seems to survive with chrome prospectors and it is difficult to get accurate lists of localities This may also be explained by the war ban on disclosing chromite occurrences.

Jacksonville, in Tuolumne County, in the eastern central part of the state, is one of the latest and best occurrences to be added to the California list. The uvarovite found there is rich in color and in showiness compares favorably with the Ural material. The crystals are larger than average, are on a chromite base and probably have a high oxide of chromium content but no chemical analysis has yet been reported.

The property is still in the prospect stage where the only work has been to develop chromite lenses and to search for uvarovite specimens. Hatfield Goudey, in a letter to the writer, says that as far as he knows, he was the first and only person to bring out specimens. Kaemmererite occurs frequently with the uvarovite, although seldom on the same specimen. Finely fibrous chrome-diopside was found on a very few pieces from one occurrence. In one locality where chromite was scarce, the garnet shows all degrees of gradation in color from emerald green to clear yellow like topazolite.

The origin of the Jacksonville uvarovite is believed to be due to the action of hydrothermal hypogene solutions on the accessible chromite of the lens which is in contact with serpentine. The largest crystals were found at the ends of a small chromite lens in fissures of both the chromite and the surrounding serpentine. Writing in May, 1946, Goudey says that his last work in search of additional uvarovite from this locality was fruitless but that it is not unlikely that sufficient additional work would produce more good specimens. It is to be hoped that he will succeed and that crystals large enough to be cut into sizable gems will be found.

Another locality reported during the war is in Eritrea, Basso Ausiba district, Cromo Littoria, on the Sclanighe River. Richard V. Gaines, of the U. S. Army, when he was stationed at Djibouti, secured a number of loose crystals broken from a matrix of serpentine, about ten to an inch, with a fine green color. Dr. Strock confirmed it as uvarovite, high in chromium content. The crystal form is a dodecahedron modified by the trapezohedron which is unusual.

For assistance in preparing this paper, the writer is indebted to Clifford Frondel, Hatfield Goudey, Joseph Murdock, Adolph Pabst, Frederick H. Pough, Lester W. Strock and the directors or curators of various museums.

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Osore-zan, Japan

In the extreme northeastern corner of Honshu Island (and pointing northward), is the Tonami Peninsula, a hatchet-shaped piece of land whose "blade" points westward. This is a sparsely settled region consisting of low hills. Tanabu, a small village, is the largest settlement.

Kamafuse-san, the highest mountain in the peninsula, is 3,016 feet above sea level.

The most noted locality in the peninsula and famous all over northern Japan is Osore-zan, which in Japanese means "the Mountain of Dread." Osore-zan, however, is not a mountain but a deep hollow in the hills behind Kamafuse-san, in which is a crater lake (Osore-ko) which is 690 feet above sea level. Densely wooded hills and small mountains surround the lake; on the east and south they rise straight up. Osore-zan is 8½ miles southwest from Tanabu.

From the volcanic mountains surrounding the lake nice crystallized sulphur specimens may be obtained. The crystals are greenish in color, contain earthy impurities, and are partly opaque. Interesting specimens of orpiment, associated with realgar and to some extend with sulphur and forming stalactitic and botryoidal masses, also occur here.

Honshu is the main and largest island of Japan.

An Early Reference to Agate in New Jersey

One of the earliest references to agate occuring in New Jersey was Robinson's who reported it as being found in rolled masses near Paulus Hook.[1]

Paulus Hook was the original name for Jersey City which had its founding in 1804. In that year a company was chartered to lay out the streets and squares for the settlement. Paulus Hook grew very slowly for about 50 years. It was but a small village when in 1820 it was incorporated as the "City of Jersey" and in 1838 when it was reincorporated as "Jersey City." In 1850 the population of Jersey City was only 6,856. After this it grew quite rapidly due chiefly to the annexation of surrounding communities and its closeness to New York City. It is now the 2nd largest city in the state, pop. (1940) 301,170, being exceeded only by Newark, pop. (1940) 429,760.

[1]A Catalogue of American Minerals with Their Localities, by Samuel Robinson, M. D. Boston, 1825, p.170

A Nurse Inquires!

Editor R&M:

Have been watching R&M for an account of your trip West or didn't you go? Have been on night duty for the past 3 months so have done very little tripping although I have been prospecting in your ads and dug up some mighty fine things.

Helen E. Wright,
Aug. 23, 1946 Castle Point, N. Y.

OBSERVATION AND PHOTOGRAPHY OF CRYSTALLINE STRIAE

BY RONALD L. IVES
Vice-President, R. & M. A.

INTRODUCTION

Although many mineral crystals are striated on one or more faces, few mineralogy texts make more than passing mention of this fact, and many beautifully striated specimens in museums are displayed in such a manner that this interesting feature is obscured.

Perhaps the best known example of surface striation is cubical iron pyrite, on which the striae, paralleling one edge of each face, are mutually perpendicular, and are probably caused by the incipient development of pyritohedral faces on the cube.

Another interesting example, although not plentiful, is cubical sphalerite, on which the facial striae are parallel to a diagonal of each striated face, and may be due to feeble development of tetrahedral faces.

Banded or laminar structures in calcite, such as that found near igneous intrusions in the Franklin area (N. J.), are usually due to polysynthetic twinning, a process analogous to the manufacture of paper dolls.

Methods of observing and photographing these striae, as determined by actual tests, are here briefly outlined. More work on this general subject, with better laboratory equipment, should produce data useful in various branches of mineralogy, particularly in the identification of pseudomorphs.

NATURE OF STRIAE

Striae on the faces of most single crystals are the result of interruptions of the plane of the crystalline face. With opaque crystals, these interruptions must be present, or the striae would not be visible. The magnitude of the interruption need not be, and usually is not, great. In some instances, at least, the deviation from the surficial plane necessary to produce a line visible to the naked eye is somewhat less than one ten-thousandth of an inch.

Very much smaller deviations can be perceived by use of a metallographic microscope, preferably with dark field type illumination; or by use of an optical flat, placed against the crystal face.

USE OF FILTERS AND POLARIZED LIGHT

Observation of crystalline faces through various color filters, to increase color contrast, seldom increases the visibility of the striae on opaque crystals. This is to be expected, as the striae are the result of a mechanical or morphological deviation; not of a color difference. With transparent and translucent crystals, however, such as banded calcite, contrast between bands can be very markedly increased by use of either color filters or polarized light, or both.

Effects produced by observing polysynthetic transparent crystalline aggregates by polarized light are quite interesting, the patterns perceived having a characteristic geometric arrangement, related to that of the crystalline structure, but much more complex than that seen by the unaided eye.

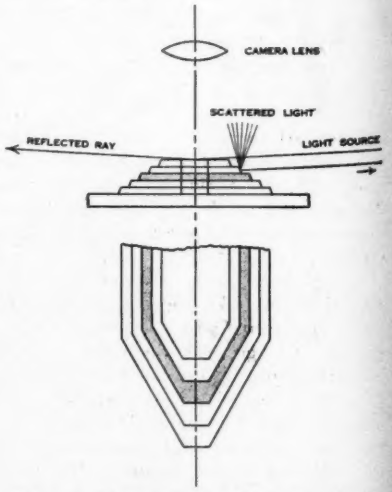


Fig. 1 Arrangement of components for photographing striae on a pyrite crystal. Lower view shows structure of striae.

OBLIQUE LIGHTING

Because of the mechanical structure of most striated crystals, and of the observation that the edges of many striae are optically rough, and give scattered reflections; while the crystalline faces as a whole are optically smooth, and give "mirror" or specular reflections; a number of experiments with oblique light, both polarized and unpolarized, were conducted.

The general procedure, which is akin to dark field microscopy, and similar to a method used by the F. B. I. for detecting and reading impressions of writing, is roughly outlined in Fig. 1.

In practice, the reflected ray (Fig. 1) is again reflected by a suitably placed mirror, so that both sides of an elevated piane on the crystal face are (substantially) equally illuminated. This method of illumination is effective for direct observation of the striae, and for photographing them.

An unretouched photograph of the striae on one surface of a crystal of pyrite, from Cripple Creek, Colorado, comprises Fig. 2.

As there are no color differences in the subject matter, use of "color blind" film

Fig. 2 Photograph of striae on a pyrite crystal. Oblique lighting was used, from a collimated beam. Greatly enlarged.

is entirely satisfactory, which permits development by inspection under a red light, to secure desired contrast. Some difficulty may be experienced with contrast in this work, and "inspection" development saves much time and film.

LIGHT SOURCES

A collimated (all rays parallel) oblique beam can be produced by an expensive piece of laboratory apparatus, procurable from a scientific supply house. A satisfactory collimator for experimental work, however, can be produced by removing the projecting lens from any reasonably good projection lantern, and replacing it by a slit about 1/8" wide in an opaque disk. Too narrow a slit will produce diffraction bands, which, while interesting in themselves, will complicate observation of striae considerably.

If desired, a polaroid disk can be placed over the slit in a collimator of this type, producing a collimated polarized beam.

CONCLUSIONS

Striations and a banding produced by polysynthetic twinning of transparent crystals are emphasized, in many instances, by viewing through polaroid after illumination by a polarized beam. Color filters will, in some instance only, give added contrast.

Striations produced by partial development of secondary crystalline faces can be viewed and photographed best when obliquely illuminated by a collimated beam. Contrast is seldom helped by use of color filters, but is increased in some instances, by use of a polarized collimated beam and a polaroid viewing glass.

A further investigation of crystalline striae should be productive. With the current availability of optical equipment at low prices, many of the micro-techniques useful in optical mineralogy can be adapted, with little or no change, to macroscopic examinations.

Upper Montclair, N. J.
August 18, 1946.

A NEW WORLD IN A TEASPOON

BY HARRELL L. STRIMPLE

Normally, when one is thinking of exploration, discoveries of new life, or adventure, many things come to mind. Perhaps long treks across arid wastes, a party climbing peaks of a mountain range in some far off land, a canoe silently gliding up some tropical river or a monstrous globe being lowered into the depths of the ocean. Who would think that anyone may sit in a room in a large city and, with the aid of a low-powered microscope, enter into an entirely new world composed of weird little beasts that flourished in an ocean millions of years ago. It is even possible and quite probable that some are forms never before viewed by human eyes for the science of micropaleontology is comparatively young and, by the very nature of the study, only an infinitesimal portion of the earth's crust has been observed. Here indeed is the ideal hobby for the scientific mind. No great amount of equipment is necessary, a few samples from fossiliferous zones and a microscope are sufficient.

Even after years of familiarity with micro-fossils, it is a never ending thrill to me when I sit down to a microscope and view a fossiliferous washing. It is remarkable that these minute forms could develope a test (external skeleton) and even more astounding that they have been preserved through fossilization. All the thrill of the search and the satisfaction of discovery are present. There are numerous types of life involved. Foraminifera occurs almost everywhere in sedimentary rocks and takes a multitude of shapes from simple tubular forms to weird globular structures. Conodonts, which are considered by some authorities to be the teeth of sea-worms, ostrocods ('sea-flies') from smooth simple forms to highly ornamental species, minature stages of gastropods (snails) and brachiopods (bi-valves),

(Continued on page 669)

BANDED ARAGONITE AND WAVY ONYX AT FAIRFIELD, CALIFORNIA

BY T. ORCHARD LISLE

Off U. S. highway 40 in California, between Fairfield and Vacaville, there are two mineral locations of interest to the "cut and polish" rock hounds who delight in making ashtrays, cabochons, paperweights, spheres and penstands. This is the main auto route between San Francisco and Sacramento, and you can take your choice of locations or cover them both in one day because there is one on either side of the road, where banded aragonite and wavy white onyx are to be found, respectively.

Fairfield and Vacaville are two small villages about 8 miles apart in the western part of the State. Fairfield is southwest of Vacaville.

The aragonite location can be seen from the highway about one mile away on a treeless hill, as it is an old quarry. A brick stack near the excavation forms a land mark. It is necessary to walk across ranch land, one should be careful of cattle, some of which are bulls that don't like strangers. The aragonite is to be found in veins of varying thickness in the boulders lying around, although most of the exposed material has been carted off by collectors. It is beautifully banded in shades of brown from light to dark sepia. Being about 4 in hardness and very compact it takes a high polish. The quarry was not being worked when I made a visit in 1943. I did not see any white aragonite crystals, and the material is all of the massive type.

Nearby, but on the other side of the highway, a trail—or old hauling road—leads up a beautifully wooded hillside about two miles to an old onyx quarry. The trail now is used for cattle. The entrance to the trail is not easily seen, and is close to an old Shell service station, which now may be rehabilitated and carrying some other brand. There also is a farm house close by that has a grove of eucalyptus trees in front. I estimate the climb to be nearly 500 ft.

At the top of the hill you go through a gate to the quarry. From this deposit hundreds of tons of the white onyx was shipped to France many years ago for making clock cases and ornaments, many of which have found their way back to the United States. I have a very attractive ashtray of this material made for me by R. F. Henley of San Francisco, following a visit we made together.

The onyx seems to have been formed by flowing soda springs. It can be worked up to a very nice polish. Some of it has fine wavy lines running through it which adds to the attractiveness. Large pieces can be secured free from cracks. The water is said to be excellent for one's digestive tract; but the first taste produces a wry face a puckered mouth. If the weather is hot, the water is a godsend after the long uphill climb, and you quickly develop a taste for it. At one point the water is piped to a cattle trough and flows beautifully cool. At another point in the quarry the onyx formation has piled up from the water trickling down over it like a waterfall, or rather a series of small waterfalls. The more the water flows the higher grows the onyx pile. Unfortunately, I did not have my camera with me.

We had just taken a drink at the trough when I heard a thud of hoofs; looked up and shouted to my friend to run for some small trees on the other side of a stream, as about fifty steers were dashing towards us. I hollered as loud as I could and at the same time waved a stick I was carrying, when suddenly the entire herd came to a sliding stop when they were not more than 20 feet away. Their leader was a fine great animal with magnificent horns, and the other steers stood waiting further action by him.

Skirting around the quarry, picking up our bags of onyx, we beat it out of the gate as fast as we could and wended our way down the trail to our car parked off the highway. But those derned steers were the most curious animals it has been my lot to meet, for they followed us—on the other side of the fence which lined the trail for least one mile.

SOME INTERESTING MINERAL LOCALITIES NEAR VANDERGRIFT, PENNSYLVANIA

BY HOWARD V. HAMILTON

187-A Franklin Avenue, Vandergrift, Penn.

Vandergrift, an industrial town in the Kiskiminetas River valley, lies in the Freeport quadrangle about thirty miles northeast of Pittsburgh. The total thickness of rocks exposed in the area is about 750 feet. They are entirely sedimentary in origin and belong to the Allegheny and Connemaugh groups of the Pennsylvania or Carboniferous system. The principal sources of mineral wealth of the area are soft coal, limestone, sandstone, fire clay, and natural gas. Other minerals may be found as cabinet specimens but not in any appreciable quantity. Several localities where such specimens may be found are shown on the accompanying sketch taken from a topographic map of the Freeport quadrangle and are described in the following notes.

1. Two miles south of Apollo on the Westmoreland County side of the river, the Kiskiminetas Coal Company operates a mine in the Upper Freeport and Lower Kittanning coals. Several hundred feet south of the tipple and just opposite the mouth of Roaring Run is an outcrop of Vanport limestone. It is marine in origin as shown by its fossils. Some of the brachiopod shells are hollow and are lined with tiny calcite crystals giving them the appearance of miniature geodes. Below the Vanport limestone is a layer of shaly sandstone containing many limestone nodules coated with iron oxide. Some of these nodules contain sphalerite, having a waxy luster and grading in color from yellowish-gray to black. The sphalerite is found in thin layers and masses in cracks or openings within the nodules. No crystals have been found.

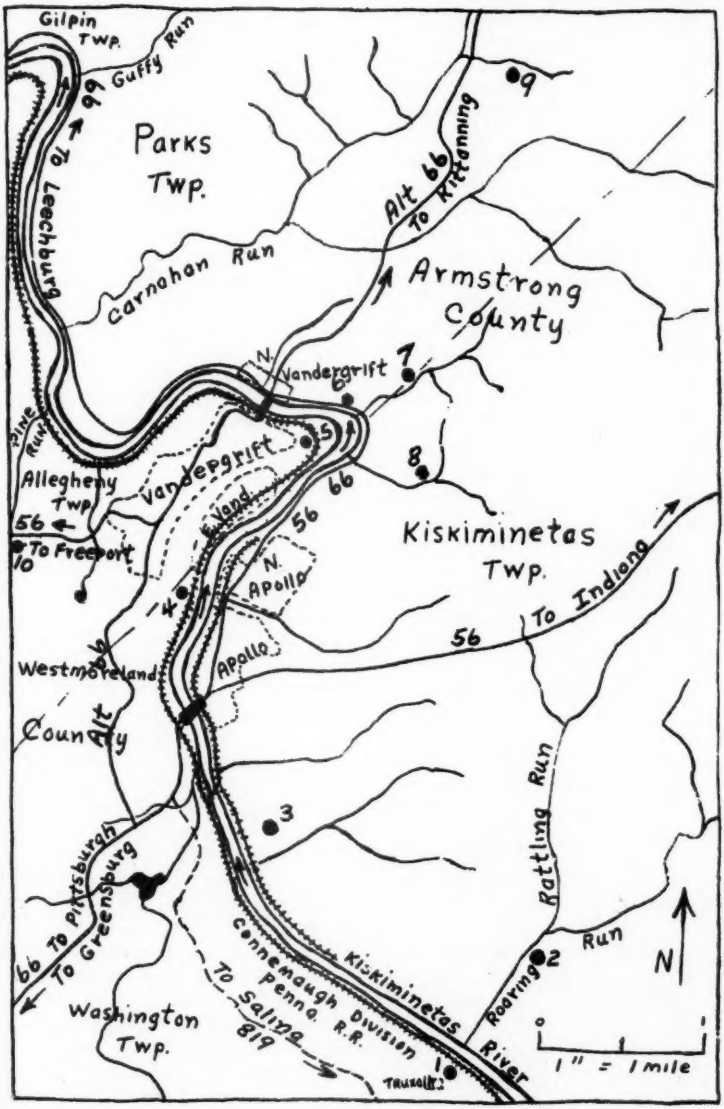
2. Along Roaring Run three-fourths of a mile from where it empties into the Kiskiminetas River is another exposure of Vanport limestone. A small band of iron ore lying directly under the limestone is largely siderite partially oxidized to hematite and goethite. Another ore band, the Burhstone, overlying the limestone is almost completely hidden. These deposits were once worked and used to produce crude pig iron in a blast furnace erected nearby in 1825. The furnace used local limestone for flux and charcoal made from nearby forests for fuel. Its ruins may still be seen across the creek from this exposure.

3. About one mile south of Apollo in Armstrong County, is an abandoned mine in the Upper Freeport limestone once worked extensively for lime and road metal. The stone is a blue-gray color which weathers to a light gray. It is thought to be of fresh water origin. At the mine opening is buff colored calcite apparently redeposited as flowstone. The surface is covered with small crystals partially rounded by weathering. These crystals are like three-sided pyramids but are more probably extended corners of rhombohedrons. In some cases these were arranged in parallel position with more of the flat face exposed. This calcite fluoresces a green color with an Argon camp.

4. Just south of East Vandergrift are large cliffs of sandstone parallel to the railroad tracks. About halfway up the slope and near poles carrying a power line, a light buff colored calcite resembling cave deposit coats the sandstone in several places. On the under side of jutting rocks is a thin black crust that sparkles in the sunlight. This material is made up of minute crystals of selenite (a variety of gypsum) and was probably derived from the action of sulfuric acid liberated from pyrites in overlying coal on the nearby limestone. The cause for the black color has not been determined.

5. Near the foundry, one-half mile east of the Vandergrift railroad station, the Connemaugh Division of the

Pennsylvania Railroad passes through a deep cut. About twenty feet above track level, an exposure of shale contains iron and limestone nodules and irregular masses of sandy limestone. The iron nodules themselves are largely composed of siderite and its oxidation products. Within the nodules a variety of minerals may be found. Marcasite occurs as botryoidal masses colored blue and gold by surface oxidation. Pyrite may be found in



Area around Vandergrift, Penn.

minute brass-yellow interpenetrated cubes and cuboctahedrons with an occasional pyritohedron. It also occurs as irregular seams and pockets. Goethite pseudomorphs after pyrite show the same crystal types as the pyrite. A few crystals appear to be truncated octahedrons. The crystals are chocolate-brown colored and are often altered only on the surface. Some of the crystals reveal a brass-yellow color inside when broken. Hematite is found as red earthy coatings and minute brown platy crystals. Calcite is in irregular granular masses of a white color. Tiny white crystals that are crested or radiating like a ball are aragonite. Small rhombohedrons which are white, gray, yellow, or yellow-brown in color are thought to be ankerite. One of the most abundant minerals found in the nodules is barite. It occurs as white, gray, or colorless masses often showing good cleavage and as small crystals. The crystals, either colorless or pale honey yellow, are usually transparent. They are found as tabular crystals having a good single termination and as stubby tabular crystals standing on one edge. The irregular pieces of sandy limestone also contain bands or pockets of barite. Quartz may be found as clusters of colorless, smoky-gray white, or rose crystals, some doubly terminated. The rose color is thought to be caused by enclosed hematite or the background of hematite showing a transparent crystal. Galena has been noted as small streaks showing a lead-gray color and metallic luster with very distinct cubic cleavage faces. Minute gray or black selenite crystals form scattered patches on the sandstone in the cut. The Upper Freeport coal outcrops near the top of the cut.

6. Along the highway (route 56) east of North Vandergrift, both the Upper and Lower Freeport coals are exposed. A shale layer containing iron and limestone nodules occurs about thirty feet above the Lower Freeport coal. The nodules and minerals associated with them are much like those found in the railroad cut across the river. The minerals noted here are siderite, hematite, goethite, pyrite, marcasite, calcite, gypsum, barite, and quartz. Of these the quartz deserves a special mention. It has been found as very small singly and doubly terminated crystals varying from colorless to white, smoky gray, and rose due to the background of hematite. In one nodule several very brilliant crystals were found in pockets of iridescent, botryoidal marcasite. These crystals, resembling those found associated with hematite at Cumberland, England, have parallel growth around the base with only rhombohedral faces showing. Another nodule yielded brilliant crystals having normal parallel growth with the prism faces showing against a background of platy hematite crystals. There are also many clay-ironstone concretions present. The sandstone below this layer contains numerous irregular masses and nodules of iron ore. The Lower Freeport coal is often coated with yellow and white powdery material that seems to be an alum.

7. Three-fourths of a mile east of North Vandergrift, route 56 crosses Gravel Bar Run. A dirt road parallel to the run, passes a sandstone quarry about a half-mile north of the main highway. The sandstone is spangled with small flakes of silver-gray mica, probably muscovite, and is covered in places with colorless or white redeposited calcite. Several types of calcite crystals have been noted. There are small radiating groups of dogtooth spar and groups of radiating crystals that resemble miniature spear heads. An unusual type of structure is found where rhombohedral crystals are interpenetrated to form a series of crystals resembling a post with triangular corners projecting. Another type of almost colorless interpenetrated rhombohedrons are arranged in a fan-shaped manner. Some of this material shows a faint green fluorescence with Argon lamp.

8. Another dirt road, left from the main highway a few hundred yards east of Gravel Bar Run, is known locally as Glorietta Hill. A sandstone quarry about a half-mile along this road is

similar in appearance to the one discussed before. Here calcite has redeposited around small angular pieces of sandstone to form a breccia-like mass. It also has coated tiny sand grains to form small clusters of "birds-nest" calcite.

9. Along the road to Kittanning (alternate route 66) about three miles northeast of Vandergrift, a small mine is operated in the Upper Freeport coal. A few hundred feet from the mine entrance a spring run has exposed the coal vein and washed out rough surfaced, botryoidal masses of marcasite coated with a thin layer of iron oxide. When broken each rounded section shows a radiating structure with colors ranging from silver gray to pale brass yellow.

10. Along the "Serpentine Road" (route 56) about a mile west of Vandergrift, a highway cut has exposed a large section of shale and shaly sandstone. Marcasite with radiating internal structure occurs as nodules among the shale. Some of this marcasite has been altered to an alum on the surface.

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A FOSSIL FISH FROM NEW YORK

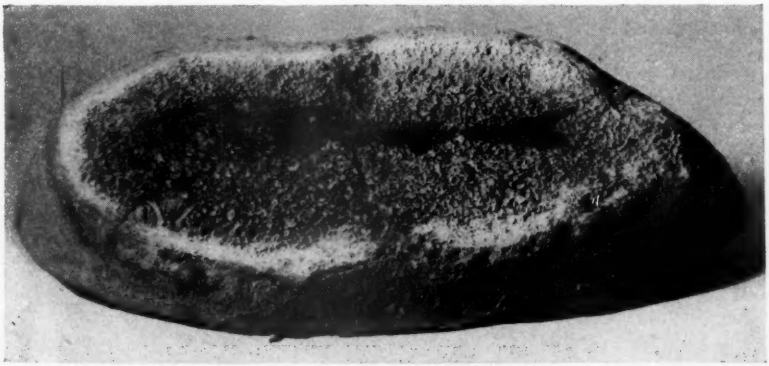
Cherry Valley, Otsego Co., New York

The accompanying photo shows a very nice fossil fish that was found, not so long ago, by a R. &. M. A. members, Oscar Frey, of near New York City. The entire specimen is about 2 x 3 inches in size and was obtained from a railroad cut through limestone in Cherry Valley, N. Y. The exact location is about 1,000 feet east of the R. R. station and south of the track. Cherry Valley is the terminus of a short spur of railroad from Cobbleskill, N. Y.

Cherry Valley is a little village in the northeastern part of Otsego County which county is in about the eastern part of the state. Cherry Valley is about 50 miles almost due west of Albany, the state capital.

Mr. Frey was spending his vacation in Cherry Valley and while there went on a number of mineralogical excursions—the fossil fish was the most prized specimen which he secured. This is an indication what interesting geological specimens may often be found in a territory not known for minerals.

Incidently, Mr. Frey states that gold and silver have been reported from East Hill, near Cherry Valley.



Fossil fish in Limestone

MINERAL COLLECTING IN NORTHERN MICHIGAN

BY WM. E. LUOMA
208 Seventh Street, Calumet, Michigan

The mineral collector in seeking Michigan minerals seldom if ever begins his search in a north to south direction. This article will treat with the minerals themselves and will make no effort to supply directions as all localities mentioned are readily accessible by car. Any native can direct the collector upon mention of the specific mine desired to visit.

The Clark Copper Mine near Copper Harbor has been abandoned for over forty years and its main claim for interest is the rugged setting it occupies in the wilderness. The writer has picked some nice specimens of chlorite from the small waste dumps. Copper in quartz is fairly abundant, as is hornblende with syenite. Some badly weathered specimens of manganese ore may be found, but none of any great value.

On the return to Copper Harbor, the collector will pass Lake Manganese, which has an outlet cutting across a heavy vein of Managanese ore. The stream offers no obstacles to the collector seeking large specimens.

Continuing in a general southerly direction from Copper Harbor, the tourist will see numerous abandoned workings. While many of these were at one time producers of fine ore, they are now too old to provide good collector's material. There are no good specimens to be found before Mohawk is reached. Here is the home of the famed copper arsenides, which number at least twelve separate combinations. To name a few, there are specimens of domeykite, keweenawite, algodonite, whitneyite, mohawkite, etc. The author has found excellent specimens of native silver and half-breeds on these old dumps. Chrysoprase, prehnite, calcite, quartz, and several other minerals of lesser importance may be found readily with a minimum of effort. All in all Mohawk is a swell stopping-off place for the collector who is crowded for time. When you go, expect anything to turn up.

The Ahmeek Mines #4, 3 & 2 are next in line, offering copper in leaf and mass form, and crystals of epidote, quartz, calcite and copper. A little search should turn up a specimen of each, suitable for the average collection.

While I have never visited the waste piles of the Allouez Mine, it would be a good idea to include it in the tour. Some nice datolite has been reported, while the usual copper specimens may also be found.

Nearby is the Kearsarge Mine which offers as nice a line as the next one. Much silver having been found with the copper, it is only natural to expect some on the dumps. Microcline feldspar, quartz, some chrysocolla, copper, silver, and a quantity of epidote crystals have been found by the author in several visits.

Next in line is the Centennial Mine which also has chlorite, laumontite, epidote and what appears to be talc.

I have personally collected at all of these mines aside from the old Allouez property and have never failed to find a few nice specimens to take home. The mines that have been closed are too numerous to mention. The best collecting grounds only are being mentioned here.

A fifteen mile jump will bring us to the Quincy Mine at Hancock, from which datolite has been taken in quantity by collectors. Some gypsum has been found, while the usual coppers and crystals are predominant.

Next to our Mohawk district, the Baltic Mine near South Range offers the best local minerals. Here may be found numerous specimens of chalcocite, occurring occasionally with bornite and chalcopyrite. Also found is a quantity of pink feldspar plus various minerals that I have as yet not identified.

Rather than go through all of the interesting localities in the Iron Country, (Ishpeming, Marquette, Michigamme and Negaunee are important localities—

and are all southeast of Keweenaw Peninsula) I will stop after naming some of the most abundant minerals. Marcasite, Martite, goethite, limonite, magnetite, grunerite, staurolite, graphite, molybdenite, feldspar, garnet crystals, hematite, specular hematite, semi-specular hematite, tourmaline, siderite, pyrolusite, psilomelane, manganite, barite, serpentine, asbestos, dolomite, gypsum and satin spar.

In summing up I wish to say that from the above account it would seem that we in Michigan have our share of this country's minerals. The copper ores and associated minerals mentioned may be found in an area about fifty miles long, while the iron ores and its associated minerals may be found in an area about 15 miles long. Good hunting, and drop in someday!

LIBERTY COPPER MINE, MARYLAND

BY VERNON J. MILLER

2120 Wilhelm Street, Baltimore 23, Md.

LOCATION

The Liberty Copper Mine is located about four miles north of the town of Liberty and one mile west of the Union Bridge Turnpike, in Frederick County, of north-central Maryland. Liberty is about ten miles northwest of Frederick, the capital of the county of the same name. The mine is approximately twenty-seven miles northwest of Baltimore.

HISTORY

The Liberty Copper Mine was at one time the largest in the copper belt that extends from the towns of New Market to Taneytown. Among the copper mines of Maryland, it probably was second in size only to the Bare Hills Mine, at Mount Washington, in Baltimore County. The deposit was worked until 1914 when it was abandoned due to the expenses necessary for finding the ore bodies. Mrs. Cashour, of Mount Airy, is the present owner of the mine's mineral rights.

PRESENT DAY CONDITIONS

There are numerous shafts and open cuts to be seen today. However, these have either caved in or are water-filled, so that collecting in them is impossible. Several toolsheds, an old kilm, and several concrete foundations are also visible.

GEOLOGY

The ore deposits of this locality are confined to a crystalline limestone. Metamorphosed sedimentary rocks and altered basic extrusives form the country rocks of the region.

MINERALOGY

Among the minerals found at the mine are:

Azurite—veins in limestone
Barite—white cleavages
Bornite—second most important mineral found; occurs as veins in limestone, these often being quite thin
Calcite—pink
Chalcanthite—veins in limestone; can be recognized by nauseous taste
Chalcocite—main ore found; usually occurs as veins in limestone; sometimes seen in lumps weighing up to several pounds
Chalcopyrite—veins in limestone; one of main ores
Chlorite—in schist.
Chrysocolla—veins in limestone
Dendrites—on limestone
Epidote and Feldspar.
Gold—reported by Dana (old edition)
Hematite—specular, reported by Dana (old edition)
Limonite and Magnetite.
Malachite—crystals and botryoidal masses
Pyrite—octahedral, reported by Dana (old edition)
Quartz—in crystals
Tenorite—reported by Dana (old edition)
Tetrahedrite—in Lee collection

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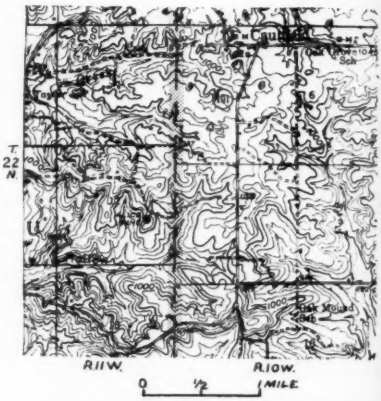
1. "Minerals of Maryland" Ostrander, Charles, W. and Price, Walter, E. Jr.; Natural History Society of Maryland, Baltimore, Maryland, 1940, pp.46-48

THE ALICE ZINC MINE OF SOUTHERN MISSOURI

BY ALBERT L. KIDWELL, Geologist

Missouri Geological Survey and Water Resources

The Alice Mine is located in Ozark County about 20 miles southwest of West Plains, Missouri. The exact location is the NW¼ NE¼ sec. 12, T. 22 N., R. 11 W., as shown in the accompanying figure which was taken from the U. S. Geological Survey topographic map of the Cureall quadrangle. Mining operations were begun here about 1890, and zinc carbonate has been mined intermittenly since that time. The old mine workings bottomed on "blue ore", the identity of which was not known to the miners at the time but which was later discovered to be a dark colored sphalerite. This sulphide ore has been extensively prospected since 1944 by the U. S. Bureau of Mines, and a considerable tonnage has been mined by Doane and Ives, the present owners.



Location of the Alice Mine.

This mine is part of the Caulifield Zinc District which is so designated from the village of that name. In the district, which is approximately 12 miles in diameter, four mines have produced zinc ore, and several prospects have been opened.

The pit at the Alice Mine is 320 feet by 250 feet and averages about 60 feet in depth. Some underground work has been done in the past and more is contemplated in the immediate future.

The ore occurs in highly brecciated zones in the Jefferson City dolomite which is of lower Ordovician Age. The cause for this brecciation is believed to have been the collapse of an extensive solution opening. No faulting or any other structural features have been found in the vicinity of the mine.

Sphalerite was originally the most abundant mineral and is most important, economically, at the present time, It occurs in two forms which are totally different in appearance. The most common is a bluish-black variety which is rather fine-grained, massive, and is frequently banded with pyrite. It often has a roughly radial structure, and tiny crystal faces are found where the openings have not been completely filled. This mineral has been erroneously called marmatite, but a chemical analysis revealed the presence of only 1.76 per cent iron which is too low for marmatite. The X-ray diffraction pattern also coincides with that of sphalerite from the Tri-State District. The mineral is known locally as "steel-jack" or "blue ore."

The other type of sphalerite is present in the form of clear yellow crystals up to about two millimeters in size. This was one of the last minerals to be formed in the deposit, and it is always later than the dark variety.

Pyrite is present as crystalline masses on and enclosed in sphalerite. Much of it is banded and has a fibrous structure. The pyrite was deposited later than most of the sphalerite, and small pyrite crystals are commonly found on sphalerite in the vugs. Some *marcasite* is intergrown with the pyrite, but it can be identified only in polished sections by microscopic examination.

Quartz was deposited after pyrite and marcasite as thin crusts of colorless

crystals on the sulphides. Quartz is also present as an original contituent in the Jefferson City dolomite in the form of chert, sand grains, and drusy crystals in cavities.

Smithsonite was the first mineral to be mined at the Alice property. It occurred in the upper 50 feet of the deposit in masses along the bedding planes and as cementing material in the fractured dolomite. In this part of the deposit it is a massive, gray, fine-grained mineral and is invariably associated with limonite. A microscopic examination of several thin sections revealed the presence of some hemimorphite intergrown with the smithsonite. The material does not make particularly attractive specimens.

In the sulphide zone, smithsonite occurs as tiny singly and doubly-terminated crystals on the other minerals. A few instances were observed where yellow sphalerite crystals have been deposited on smithsonite, but the reverse of this is much more common.

Greenockite is found as a thin, greenish-yellow stain on sphalerite, pyrite, smithsonite, and the country rock. The cadmium ion is believed to have been originally contained in the sphalerite and has been released upon oxidation of the sphalerite and reprecipitated as greenockite. The ore contains an average of .25 per cent cadmium.

Limonite was formed as the oxidation product of pyrite and marcasite in the upper part of the deposit. Many specimens, when broken, reveal the presence of unaltered pyrite remnants.

Dolomite is the principal mineral constituent of the Jefferson City formation which is the country rock of the area.

Galena is probably present in small quantity, but none has been reported. Analyses of churn drill cuttings from the property show a lead content up to .33 per cent.

The Alice Mine is being worked at the present time, and permission to collect minerals on the property should be obtained from Mr. Earl Doane, one of the owners, who is in charge of the operations.

Ems, Germany, Noted For Pyromorphite

Ems, a little city in western Germany, is situated on both banks of the Lahn River in a narrow valley. It is about 6 miles southeast of the city of Coblenz (on the Rhine). Ems has for centuries been famous for its warm baths and minerals springs (saline and sodium carbonate)—it attracts thousands of visitors annually (chiefly in summer) most of whom seek the beneficial relief which the waters can give them.

To mineral collectors, however, Ems is famous for its fine pyromorphites which are among the finest known.

It was on the promenade at Ems that the Emperor William of Germany slighted the French Ambassador, Count Benedetti, which led to the Franco-German War of 1870.

Ems is still mentioned in mineralogical literature as being a city in Nassau (from 1803 to 1886 it belonged to the Duchy of Nassau) but it is now a part of Prussia.

Near Ems are important lead-silver-mercury deposits and from their mines have come a number of fine minerals of which pyromorphite (in large brown crystals) is the most important. Other fine minerals occurring there are cerussite, copper, galena, galena pseudomorph after pyromorphite, gersdorffite, and sphalerite—all in fine crystals or groups of crystals. Other minerals found in the mines are anglesite, azurite, bournonite, chalcocite, cuprite, hematite, malachite, quartz, siderite, etc.

Two Dealers Merge

Graffham's Commercial Museum, of Ottawa, Kans., whose owner was A. Allen Graffham, a member of the R. &M.A., and the Omaha Scientific Supply Co., of Omaha, Nebr., (R. B. Berry, Mgr.) have merged their businesses under the name of the Western Geological Supply Co., Box 1750, Omaha 4, Nebr.

They will handle minerals, gem materials, thin sections of minerals and fossils, fossils, lapidary equipment and supplies.

ATLAS QUARRY, HARDYSTONVILLE, N. J.

BY PETER ZODAC, Editor Rocks and Minerals

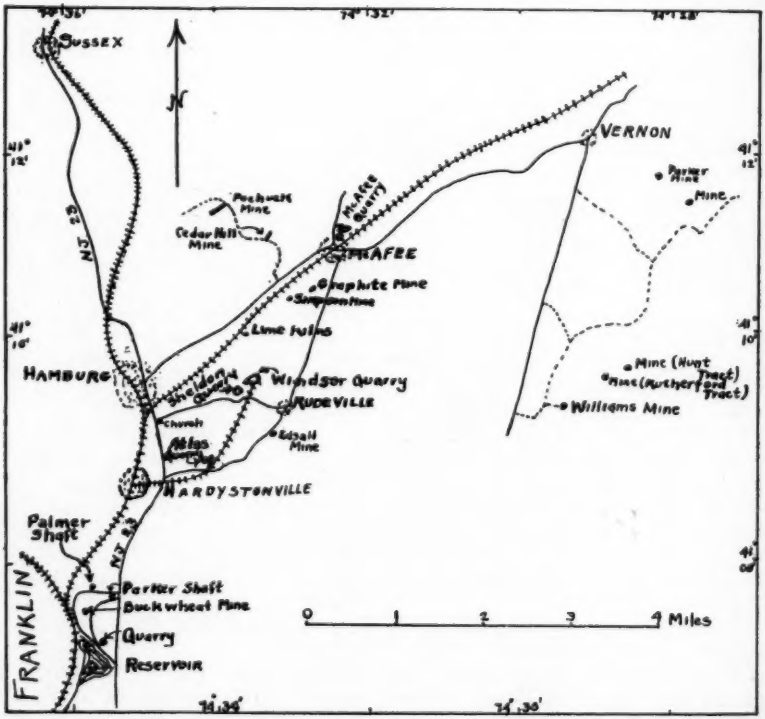
Hardystonville is a little hamlet 1 mile northeast of Franklin (on N. J. 23) in northeastern Sussex County (in the northern part of the state). Near the hamlet is an abandoned limestone quarry which has produced a number of interesting minerals. The quarry is also in the township of Hardyston which received its name in 1762 from Josiah Hardy who was Governor of New Jersey, 1761-1763.

This is the fourth article in the series on mineral localities in northern Sussex County; the first one on the McAfee limestone quarry appeared in the July, 1946, issue of *Rocks and Minerals;* articles on the Sheldon and Windsor limestone quarries appeared in the August and September issues, respectively.

Location

The Atlas quarry is not only off the main road but also a little distance off the side road so that a collector could easily pass by without realizing its presence.

The macadam road which goes past the quarry begins at Hardystonville (an old abandoned railroad track crosses Rt. 23 and follows the road for a short distance—look for this track!). This track and road are 2.9 miles north of the reservoir in Franklin or 0.8 miles south of the gray stone First Presbyterian Church in Hamburg which is alongside the upper road to Rudeville.



Sketch map showing location of Atlas Quarry and other localities north of Franklin, N. J.

(See map). Go about 0.9 mile east on the macadam road and then make a sharp left turn on a dirt road which goes to the quarry—500 feet away. The abandoned railroad track crosses the road here and goes to and past the quarry.

There are two quarries about 50 feet apart at the site and both are filled with water. The one on the left is about 300 feet in diameter with walls 50 feet high above the water; the one on the right is about 500 feet in diameter with walls 20 feet above the water.

Mineralogy

The following minerals have been collected from the dumps of both quarries:

Amphibole (Hornblende): Black crystalline masses associated with biotite.

Apatite: Small pale green crystals in white limestone.

Biotite: Small flakes associated with hornblende.

Calcite: Chief constituent of the coarse crystalline white limestone which is the rock of the quarries.

Fluorite: Purplish incrustations on limestone; also on hornblende.

Graphite: Small flakes in limestone; large lustrous foliated masses in smoky quartz also present.

Phlogopite: Bronzy crystals and flakes in limestone .

Pyroxene (Augite): Dark green lamellar masses.

Pyroxene (Diopside): Green crystalline masses in limestone; also small green gemmy crystals in limestone.

Pyrrhotite: Small bronzy metallic masses in limestone.

Quartz: Smoky, massive.

Titanite: Small, brown, wedge-shaped crystals in limestone and in augite.

Tourmaline: Black, also brown, crystals in limestone.

Wernerite: Small grayish crystals in limestone.

Beautiful Agate Discovered in Colorado

A most beautiful and remarkable agate was recently found by W. C. Eyles, of Bayfield, Colo., and Oscar Gisler, of San Francisco, Calif., who were prospecting together in southwestern Colorado. The find was made in a remote wilderness area called the Embargo Mining District, near Wagon Wheel Gap, at an elevation of 9,500 feet.

The agate occurs in a volcanic ash and is found in all sizes from that of an egg up to pieces as large as a melon. Writes Mr. Eyles, who is an authority on agates, "It's the most beautiful agate discovered in years. We have never seen its equal. It is far more beautiful than any to come out of Brazil, or even Montana. It is uneven in shape—not one has the regular oval agate shape. Yet it is all clear agate with all the colors but mostly carnelian; some are heavy with color, others light or mottled or mossy, etc.

"We found that in trying to slice it the diamond saw slowed up to a walk. The saw cuts ordinary quartz at a speed of 3 square inches per minute, Montana agate faster than I square inch per minute, but this new agate, the saw could do not better than a quarter of a square inch per minute which is slower than that for jade. Its hardness is greater than that of ordinary agate—topaz barely scratched it although it scratched every other agate we tried. Another unusual feature of the new agate is that every fraction of it is solid so that there is no waste whatever in slicing it."

—o—

A new world in a teaspoon

(Continued from page 658)

sponge-spicules, sea-urchin spines, micro-crinoids (ancestrial to the starfish), bryozoans and a great host of sea-life may be found in various horizons. Many forms are so small that hundreds of specimens may be placed in a single capsule.

For the student of natural history, micropaleontology offers new horizons in the field of science.

TURQUOISE IN AMERICA'S HISTORY

BY JOHN L. CROSS

Egypt had her lapis lazuli, China her jade, Persia her pearls, and America her turquoise. The popularity of America's turquoise spread from what is now Southwestern United States, through Mexico and Central America into South America. Chalchihuitl was much prized by the Indians of Mexico and Central America and expeditions found their way northward into the land of the Cliffdwellers and Pueblos, bringing with them plumes of tropical birds as well as live ones to trade for the "Sacred stone" of the Pueblos. Rich indeed was the proud possessor of a turquoise ornament. Nothing was more highly prized by the Indians of the Southwest.

Turquoise to the Indian is the embodiment in something tangible, of the blue of the sky, the spirit of the heavens, and the blue of mystic oceans and waters. It brought happiness to the wearer, good hunting to the hunter, and spoils to the warrior. The Navajo and Zuni still stud their silverwork with turquoise, such pieces being much in demand by wearers of costume jewelry.

Color found in turquoise range from the palest blues to the deepest greens and among the Indians colors proven by long use and much wear are most in demand. Hence perfect stones from ancient sites are deemed priceless. Turquoise often served as a medium of exchange and tribes whose territory contained deposits of this stone were held in highest esteem by their neighbors. The Tiffany mines of Los Cerrillos, New Mexico, are still claimed by the Santo Domingos. Other deposits in New Mexico and Arizona have been worked since ancient times. Evidence at these sites tell of the mining, cutting, piercing and polishing methods used by ancient Indian lapidarists. Deep grooves are to be found on rocks and ledges in the Indian country of the Southwest where shaping had been done. Two sides of the rough newly mined turquoise was flattened and worn smooth by rubbing the piece back and forth on a piece of abrasive stone, generally sandstone. These pieces were then pierced with stone tipped pump drills and then strung upon a piece of sinew or tough fibre and drawn back and forth across the abrasive stone. Turning of the strand and a change of pressure as the strand was drawn back and forth, varied the shape and diameter of the pieces. Such was the method of cutting stones to shape. We would be more correct to say rubbing rather than cutting. Polishing was done with a piece of buckskin and involved a great deal of time and patience.

The abilities of the ancient lapidarist of the Southwest rank high when we consider the primitive methods used and the fine results obtained.

Important Discovery Made in Arizona

Nothing is more thrilling to the collector than to discover a turquoise jewel of ancient workmanship. The thrill experienced by Earl H. Morris as he unearthed in 1923 the ancient ring pendant at Canyon del Muerto is known only to the collector or archaeologist. This pendant is comprised of a ring of hardwood 3¼ inches in diameter with a mosaic formed of 81 pieces of turquoise. At the time of discovery this was the most ancient known piece of turquoise ever found in the Southwest. To my knowledge no piece since discovered has proven older than this ancient pendant.

Canyon del Muerto is located in northeastern Arizona, running in a southwesterly direction from the Chuska Mountains. The canyon is 25 miles in length, the mouth lying approximately 55 miles south of the Arizona-Utah State Line. The slaughter by Mexicans of a group of Navajo Indians in a cave in this canyon led to the naming of the canyon "del Muerto" or "Canyon of Death" (by the Mexicans).

During the fall of 1923 Earl H. Morris began studies in the canyon for

(Continued on page 679)

COMMENTS ON SOME LANCASTER CO., PENN., LOCALITIES

The celebrated Gap nickel mine is not worth a visit if it be made solely for minerals. The mine is about 1 mile north of Bart (Georgetown). The dumps are not very large and what is left on them is so badly altered, weathered etc. that hardly one good specimen may be found. Of course a collector may stumble upon some nice specimens, especially millerite, which once were found in excellent quality.

The Quarryville quarry (see Oct. 1942, *Rocks and Minerals*, p353, for a description of it) is not worth visiting either but some nice rutile crystals have been found in it. Nice rutile crystals occur loose in the field on the Howard Wirtz farm (see "Money Stone in Pennsylvania," Jan., 1944, *Rocks and Minerals*, pp.6-7).

The Wood's chrome mine was one of the celebrated localities of the country when it was in operation but it has been abandoned for years and much of its large dump is gone—carted away for road fill. A large rock outcrop near the water-filled pit has been quarried and the stone crushed on the premises, also for road fill. This quarry did not yield any good specimens as far as it is known. But a visit is recommended to the mine. Here is how to reach it. On the northern outskirts of the little village of Wrightsdale (on Penn. 172), turn left (east) on the black top road and go about a mile until you come to a small log cabin, on the left, at the cross roads. Here turn right and go straight ahead for about a mile and where the road makes a sharp turn to the left, go straight ahead through a large white gate. The road goes through heavy woods and a short distance in it branches. The road to the left goes through a gate and a short distance in past the gate and to the left is the Carter Chrome mine (the mine may be only a few feet past the gate). The road straight ahead may go to the Louis chrome mine, which is also in the vicinity, while the road to the right ends at the Wood's chrome mine. The total distance from the first gate to the Wood's mine is about 1 mile.

The Geiger serpentine quarries (also known as the Octoraro Stone Co's., quarries) are of interest because of the very fine talc and picrolite specimens which occur here. The picrolite (serpentine) has to be handled very carefully as it is often in such sharp needles that it is difficult to pick up without sticking the fingers. To reach the quarries, take the dirt road right at the very Pennsylvania-Maryland State Line, which leads off to the left from U.S. 222, and go about a mile when you will see a poor dirt road branching off to the right and going downhill through an apple orchard. Turn in on this poor road as it goes to the quarries, a short distance away and close to the Octoraro Creek which flows south to empty into the Susquehanna River.

The Low's chrome mine is also called the Line Pits because the pits are right on the Pennsylvania-Maryland State Line—half of them are said to be in Pennsylvania and half in Maryland. They, too, have been abandoned for years and now yield few good specimens. But chromite, serpentine, and especially williamsite are still to be found and in good quality. To reach the pits, go south from the Pennsylvania-Maryland State Line, on U. S. 222, and take the first road to the right (about ½ mile south of the Line in the little hamlet of Rock Springs). This is a dirt road which you must follow for about ½ to ¾ mile when you will see a faint grassy road leading off to the right. About 300 feet in on this grassy road are the pits.

Along the left side of the dirt road from Rock Springs and before the grassy road is reached, an oligoclase quarry is said to be present but cannot be seen from the road. This quarry is in Maryland and search for it will yield good specimens of oligoclase.

The Amateur Lapidary

DO NOT ABUSE A DIAMOND SAW!

BY DR. W. B. S. THOMAS

With the increase in the use of various types of saws for cutting stone, there have been many complaints against the saw manufacturers. This type or that type is condemned by the eager, impatient amateur lapidist, who knows nothing of the finer points governing the use of saws. It appears so simple, one puts the saw on an arbor, the stone in the vise and presto, the motor transmits power to the saw tearing the stone apart in a fine line.

There should be more respect and consideration for the saw. The manufacturers were very careful to select the proper materials, usually, a relatively soft metal like copper or soft iron, and an abrasive of some sort. In some saws the abrasive is planted in slots in the rim, the rim being thicker than any other part of the saw. In others, the grit is picked up by the saw from a bath containing both the grit and the lubricant-coolant, usually water, to which some add modern detergents. Some swear by the mud saw. The quicker, more expensive diamond saws come in for the most abusive slander. Too much is expected of the saw. American craze for speed and production urges an already remarkably fast cutting toool to greater effort. So more weight is placed on the pulley, which draws the vise carriage across the face of the saw. Sometimes an impatient hand is placed on the carriage adding extra pressure crowding the work against the diamonds. More heat is generated as a result of the friction. An overload on the motor is created but the effect on the saw is most disastrous. The rim is hard, full of diamonds; the material is soft, pliable to some degree. Pressure from the rim tends to buckle the otherwise perfectly flat, true circle of material. Consider the factors, the energies for which the engineers allowed when designing the saw.

Picture a circle of tin, like the cover of a can. You can tear it in half easily if you flex it back and forth until a hot, stress line develops across one of its diameters. In the saw the stress line is worked into a circle around the washer where crystallization may take place. Suddenly the saw is no longer revolving although everything else is working. A clean, neat circle has been taken out of the saw. When the saw was examined just prior to the loss of its center, it will be found that there is a circular bulge just around the arbor hole, that the rim, which has been crowded by pressure and unable to expand, has stayed the same size as originally or is actually smaller, while the more central circles of material have been expanded by the flexing process produced by excessive pressure.

If there has been a little end-to-end "wink" or play in the bearing of the saw arbor, flexing the saw, the condition may develop spontaneously without pressure but will develop much more rapidly with pressure on the rim. The saw cuts off on a tangent.

In the large wood sawing mills of the woods, this condition is known as "rim bound." There is a man who constantly checks saws for such defects. He corrects early cases of "rim bound" saws by placing the saw on a flat anvil. With a ball-peen hammer he expertly taps from the rim toward the center, radial lines of tapping pound out the tension in the rim making the outer circumference larger to fit the increased inner circumferences that have developed.

These simple rules are therefore suggested:

1. Do not blame the manufacturer. He knows his business, do you know

all there is to know about saws?

2. Use sufficient power so that you do not develop overload on the motor or permit the saw to hesitate.

3. Use correct and copious lubricant-coolant.

4. Find out the correct weight to place on your pulley. Each saw is different. The larger the diameter the easier it is to ruin the saw by crowding.

5. Do not crowd your saw. Give it time. Then you won't cut parabolic sections.

Editor's Note: This article and a letter from Dr. Thomas were read before printing by the Norton Company engineers, of Worcester, Mass., and the following comments made:

"The only serious criticism of your letter was operating the wheels at 2200 r.p.m. and this, assuming that reference was made to the 12" wheel would mean 7000 s.f.p.m. which is considered too high. You will note that one of our laboratory men has stated "a suitable peripheral speed is between 3000 and 4000 s.f.p.m." By using surface feet per minute the various diameters can be qualified as to r.p.m.

"Direction of work travel should always be *exactly* at right angles to wheel spindle to prevent wheel dishing by work contact on one side of the wheel.

"Normally many diamond saws of the most suitable specifications for mineral cutting show dulling and progressively slower cutting with continued use. Resharpening by application of a suitable abrasive dressing stick (soft silicon carbide stick, 37C150-J crystalon) to remove metal and expose new sharp diamonds has proved to be much safer and more successful than attempts to force the cutting with increased pressure.

"A light oil lubricant is recommended, such as Mineral Seal."

GADGETS AND RUTS

BY LLOYD M. DEMRICK

This article starts off on a subject other than minerals - but it is necessary to illustrate our thoughts to follow.

Many years ago in the hills of Kentucky and kindred areas the use by the natives of their Long Toms and muskets was quite an art. Their very existance often depended on quick, accurate shooting.

On their competitive shoots, which they took very seriously, they fared forth with their favorite weapon, a horn of dry powder and some lead slugs and went at it.

They did remarkably good target shooting with the few accessories they found necessary in those days. And in the field after game or foe they really showed their skill.

The target shooter of today, by contrast, almost has to have an assistant to carry his equipage up to the firing line. Nothing less than a fair sized tool box will suffice to house his minor 'accessories.' I know, I have all the do-dads in my own shooting box; thermometer, telescope, wind chart, sight micrometer and all the other things. Native skill has degenerated to a skill of gadgets.

Also, like many of the other target shooters, I am a poor hunter, which is the practical side of shooting.

Since the gem cutting bug got a-hold of me several years back, my shooting has waned almost to the vanishing point. But I see a parallel in the two skills - the GADGET parallel.

Gem cutting, with all the gadgets coming on the market, is also degenerating into a knowledge of gadgets. No skill to speak of will be required - but oh, how we like to show our cut stones to the uninitiated and bask in their admiration of our ability.

But are we not getting further away from originality and the skill it developes. If a craft hobby requires nothing more than pushing a button and a machine goes clankety clank, buzzes a

bit and spits out a perfectly made something-or-other, hmm that's no hobby craft, that's commercial and you should start selling the product and consider yourself as working, not playing.

On the other hand I do not advocate going completely back to the bow-string period of the craft. Wait! that bow-string might be something to wrestle with a bit, just for the fun of it. The outsider might not be particularly impressed by some beads, say, you had drilled by the use of a bow-string but your own satisfaction would be its own reward. You would know that your own skill was equal at least to that of the aboriginal craftsman. And that was something considering his tools.

Of course you would not have to carry the art to the point of wearing a loin-cloth and sitting on the ground while doing your work. However you could if you were that much of a stickler for details.

We Americans seem to be gadgeteers at heart so maybe this is a lone voice crying in the wilderness. All right, let's go ahead and use the gadgets that have been developed. Soon we will be turning out piece after piece of near perfect work with hardly any attention to what we are doing. I did, and soon found my interest waning. Then one evening while groping for something interesting to do the thought of an old fashioned jamb peg assailed me. (Most professionals still use this jamb peg it seems.)

My first stone, after making the jamb peg out of a piece of maple, was a sort of parallel to the story of leveling a table by cutting bits off first one leg then another till we wound up with a twenty inch high coffee table. My garnet was a one carat remnent of what could have been a three carater. I think of it as my Coffee Table Garnet.

My next jamb peg job was a Golden Beryl. This was a little easier, but the back has one ring of peculiarly, though uniformly curved facets. One of the facets got away from me in po'ishing so I curved the others to correspond.

It is hardly a conventional cut but is very attractive - and that is the thing we want most in gems anyway.

This jamb peg approach is but one of the things you might tackle. Perchance you have wondered how difficult it would be to make a cameo, engrave a scarab or maybe piece together a mosaic of some sort.

Find out what you can on a subject and have a go at it. You will find your interest in your hobby perking up when you have a problem on your hands.

Don't let yourself get into a rut.

———o———

Cannel Coal in Kentucky

Cannel coal is a dull black, massive, non-coking, tough, clean variety of bituminous coal. It ignites easily and burns with a long yellow flame. It is an ideal fireplace fuel as it is the richest of coals in its illuminating power and the best cannel coal in the United States occurs in Kentucky.

The famous European localities for cannel coal are Wigam, in Lancashire, England, and Gilmerton, near Edinburgh, Scotland. Kentucky has a number of occurrences but the most famous is Cannel City in southern Morgan County (in the eastern part of the State).

It was originally called "candle coal" because it catches fire easily, burns with a bright yellow flame like that of a candle and in many places it was used as a substitute for candle-light. The term "cannel" comes from Scotland and northern England where cannel is the common pronounciation of candle. In some places of Scotland it was also called "parrot coal," perhaps from the crackling noise that takes place during the time it is kindling.

Cannel coal is sufficiently solid and hard to be cut and polished; in England it was for a long time employed for making inkwells, paper weights, and other ornaments. The Kentucky material is well adapted for cutting and polishing and no doubt many specimens have been made into ornaments.

THE ELECTRIC SOLDERING IRON AS AN AID IN LAPIDARY WORK

BY C. C. CURTIS

Corpus Christi, Texas

For some amateur cutters the process of dopping or cementing the stone to the dop stick is a source of aggravation, disappointment and some times a mess.

Most authorities recommend a small lamp, preferably alcohol, and for cementing batches, the melting in a suitable container of a quantity of cement.

The process of dipping, moulding with wet finger etc. is familiar to you all. Doubtless, too, some no more clumsy nor inept than this writer, has seen open flame run along an oily rag, to the diamond saw lubricant. No fooling, we will not discuss the difficulties and hazards of the old method—you know them too well. But we offer this suggestion to those who have never tried it. An electric soldering iron. To anyone previously and even moderately skilled in the use of this tool it is a "Natural."

The cement is handled exactly as soft solder, except for the folowing reservations.

The iron does not require as much heat as for soldering and if allowed to maintain a high temperature, will burn or char the adhering cement to an ashy dross which must be scraped off.

To those not familiar with the soldering iron and wish to try it, the following is suggested. Obtain an electric iron of light or medium weight to make for easy handling. A "Stanley Victor" with a 5/8" flat point is ideal. It combines balance, light weight, durability and quick heating qualities. A fixed or variable resistor of several Ohms should be wired into the circuit in series with the iron. The variable resistor will function from zero resistance (for quick heating) to as high as desired.

The fixed type of resistor should be bridged with an "off" and "on" switch; "off" to allow a quick, "on" for prolonged use on batches.

Some of you ingenious workers can, no doubt, rig up an automatic heat regulator. But the idea is to prevent the iron, in prolonged use, from reaching a temperature that chars the cement. However, with care, the resistor can be entirely dispensed with. A metal or fiber serving tray or a large flat tin bucket lid makes an ideal work spot, or even a slab of glass.

Lay a mass or chunk of cement on the tray. With iron in one hand heat or puddle a spot in the center, move iron slightly to one side and insert the end of the stick. By manipulating both iron and stick in the puddle any amount of cement can be built and removed on end of the stick. If working a batch, treat all the sticks first. Then lay a large piece of cement (or several short pieces stuck together) on a small block or large match box three or four inches high, allowing one end to overhang. Then holding the stone underneath the cement, touch the edge of cement with the iron and allow one or two drops to fall on the stove. Smear it with the hot iron. This cement is now thoroly *stuck* or *sweated* to the stone. Lay all the stones, cement side up, on the work tray and touch each stick end against the iron until the cement starts to flow. Then stick it squarely against a stone, press firmly, and lay aside.

For further reinforcing or shaping and squaring with the stick. Holding the stick with the stone back under the overhanging piece of cement, touch with the iron until drops fall where needed and build up to the shape desired. With a little practice a few deft touches will give any shape or reinforcement to the cement. Cement applied to a stone in this manner is very tenaceous and greatly reduces the percentage of "knock offs" while working.

To remove the stone from the stick run the point of the iron around it until the cement flows, lift off the stone and remove the residue in the usual manner.

Club and Society Notes

North Jersey Mineral Society

A regular meeting of the Society was held on Sept. 12, 1946, at its headquarters in the Paterson Museum, Paterson, N. J. The meeting was devoted to talks by members on their collecting experiences during the summer with a display of specimens collected.

A two day field trip was held by the Society on July 13 and 14, 1946, to the Gillette and Strickland feldspar quarries in Connecticut, both famous for their minerals. The Gillette quarry, in Haddam Neck, is especially famous for its gem tourmaline crystals; the Strickland quarry, near Portland, is noted for its wide variety of fine minerals. The trip was made in 8 cars, the weather was ideal, and many specimens were collected.

Wisconsin Geological Society

A regular meeting of the Society was held on Sept. 3, 1946, at the Milwaukee Public Library, Milwaukee, Wisc. The program consisted of short talks by members on their summer collecting activities and a display of specimens collected.

Maine Mineralogical & Geological Society

On Sept. 15, 1946, the Society held a Clambake at the residence of I. S. Skillin, in Freeport, Me. Quite a number of members attended and all had a most enjoyable time.

Northern Federation of Mineralogical Societies

The Annual Convention of the Federation was held in Boise, Idaho, on Aug. 31 and Sept. 1, 1946. One of the localities visited was the Beacon Hill district where superb nodules were found. On Sept. 1st, the group were dined by the Chamber of Commerce of Weiser, Idaho, at the Washington Hotel in the city. John Glass, of Weiser, president of the Snake River Gem Club, of Weiser and Payette, presented to each member a piece of native petrified wood as a souvenir.

Springfield Mineralogical Society
(Springfield, Vt.)

This Vermont Society is a wide-awake organization whose members make frequent trips to various New England localities. A noted locality in its area is the talc mine at Chester which is famous for its fine pyrite cubes. On Aug. 21, 1946, the Society held its Annual Corn Roast.

Yavapai Gem and Mineral Society
(Prescott, Arizona)

The important part which garnets and silver played during the war was described at the Aug. meeting of the Society, by J. Walters, Jr., president of the Yavapai County Council A.S.M.O.A., and H. F. Mills, member of the board of governors of the Arizona Department of Mineral Resources. Walters gave the origin and history of garnets, and told how during the war they took the place of diamonds as abrasives and for bearings. Mills described how silver was used in aircraft, atom bombs, cyclotron experimentation and many other ways in addition to its previous uses.

The entire program was arranged by the junior members with Palmer C. Byrne, Jr., chairman, and John Butcher, secretary.

Ida Smith, Sec.

Oklahoma Mineral and Gem Society

We wish to announce the organization of the Oklahoma Mineral & Gem Society in Oklahoma City, Oklahoma. On June 6th, 1946 this Society was incorporated under the laws of the State of Oklahoma with 17 charter members.

Regular meeting date, first Thursday of each month, and meetings, for the time being, held at homes of members.

At the September meeting the Society had as guests Prof. Blocher and Mr. Dean Stewart of Amboy, Illinois, veteran collectors who had just completed a vacation tour of mineral hunting through several of the Rocky Mountain states.

The officers of the Society are as follows:

Mr. J. B. Lankford, Pres.,
1138 SW 38th St., Oklahoma City, Okla.

Mr. George Smith, Vice Pres.,
608 NW 34th St., Oklahoma City, Okla.

Mr. J. E. Gilkie, Sec-Treas.,
1625 NW 29th St., Oklamoma City, Okla.

C. S. Smotherman
Chairman, Publicity Committee

Central Iowa Mineral Club

The regular meeting of the Club took place on August 2nd, 1946.

Paul Murray Work spoke on the "Geology of the Des Moines Area."

A Field Trip was planned for August 18th to the Winterset, Iowa, quarries and Park. Mr. Work will be in charge.

Mrs. R. G. Hays
(Secretary)

Pomona Valley Mineral Club
(Pomona, California)

The POMONA VALLEY MINERAL CLUB met for the August meeting at the home of Mr. and Mrs. Lewis G. Taylor in Claremont. The very talented Taylor children entertained an appreciative audience with several violin selections. Door prizes went to Mr. Kryder, Mr. Helfor and Mr. Weist. The speakers for the evening's program were Mr. Hollis B. Page and Mr. George J. Bellemin.

Mr. Page spoke briefly on "SARDONYX"- the birthstone of the month. "While authorities, he said, on this gem stone do not all agree on what constitutes true sardonyx, they do agree that sardonyx is a variety of chalcedony, and the study of chalcedony shows that it is different than quartz and therefore may be a distinct species, as it often contains some disseminated opal silica.

"Sardonyx or carnelian-onyx are two words used to designate one of the sub-varieties of banded agate. The double terminologies apply to agate with red and white bands. Those with a translucent, reddish tint are termed "carnelian." When the layers of color are black and white and the banding is straight it is called onyx. To be classed as sardonyx the gem must present layers of brown and red bands with milk-white bands in straight lines and of uniform thickness. Sard is usually harder and tougher than carnelian. Undoubtedly, the cause of color in the gem can be attributed to the presence of small amounts of impurities in the form of oxide of iron, hematite or limonite. Hematite tends to produce the reddish shades while limonite predominates in the yellow and brown shades. The stone was much used in Biblical times. Ancients obtained it from India; also from the great Arabian and Egyptian deserts. Mt. Sardonyx, referred to by Ptolemy, is supposed to be near Broach, India, where agates and carnelians are still worked. It has been used for centuries in cameo cutting. Most of the modern sardonyx is cut from South American agate modified by artificial treatment."

"HOW TO DETERMINE A NEW MINERAL" was explained by Mr. Bellemin—geology instructor. When the ordinary layman or even the more advanced collector finds a new mineral specimen that he is not familiar with, the first question he frequently asks is, "What is it?" Answering that question, said Mr. Bellemin, is not always easy. A knowledge of the common varieties and a mental comparison of the appearance of the unknown with the known is often the method of identification. A few simple tests might be more satisfactory and more accurate. However, positive identification of many minerals is sometimes a rather complex task.

There are many methods for determining minerals. These can be divided into two main groups; determination by physical properties and determination by chemical properties.

The most common method is the sum total of the physical properties visible to the naked eye or hand lens. This includes observing color, lustre, streak, cleavage, structure, hardness, crystal form and specific gravity. In nine out of ten cases this method is satisfactory. For the more difficult determinations the petrographic miscroscope is used. This is a more exacting procedure but usually is very satisfactory and accurate. The identification is made by means of the optical properties of the mineral and its effect on a beam of polarized light. The X-ray pattern of the atomic structure of a mineral is also useful in a determination.

Of the chemical methods, a spectrographic analysis will determine all the elements present in a mineral. Ordinary qualitative and quantitative chemical analysis will determine the elements present and their amount. Sometimes this is not sufficient for identification because there are some minerals with the same chemical composition but different atomic structure. More rapid chemical checks may be made by means of the blow pipe or borax bead test.

In describing a new mineral species a good deal of work must be done. First of all, the physical properties determinable with the naked eye must be described. These include color, lustre, cleavage, hardness and specific gravity. Color must be very accurately described, using a standard color chart. Moh's scale of hardness is used to determine the hardness, and the specific gravity must be obtained exactly. All the optical properties are determined through the petrographic microscope. Some of these observations must be made under constant temperature conditions with monochromatic light. If any good crystals are available, their characteristics must be described by means of a goniometer. A spectrographic analysis should be made to determine all the elements present, even to the traces. Then a quantitative analysis can be made of the principal elements and a chemical formula calculated. An X-ray analysis will complete the description. In the case of opaque minerals a slightly different procedure would have to be used. In any case, the determination of a new species is a lengthy, exacting procedure."

Edythe M. Thompson
Pub. Chm.

Northern California Mineral Society

Three meetings were held by the Society during September, 1946. On Sept. 13th, a business meeting was held. On Sept. 18th, a general meeting at the Public Library in the Civic Center, San Francisco; the speaker at this meeeting was Chas. J. Hansen. On Sept. 27th, a lapidary meeting.

Colorado Springs Mineralogical Society

The May 15, 1946, meeting marked the beginning of a mineral collection to be built in the name of "The Colorado Springs Mineralogical Society" and to be placed in the Pioneer Museum in Colorado Springs. Specimens are to be loaned by the members to form a nucleus around which it is hoped a choice collection will be formed.

Mrs. Smith, Curator of Museum, favored the Society with a historical review of the institution and pointed out future possibilities and plans now underway for expansion. All was very interesting and increased the desire to get the collection started at an early date.

A special meeting was held on June 4 to arrange field trip plans and for members to place loan specimens in the hands of a museum committee to choose and pass on the desirability of the specimens.

A regular meeting was held on June 26th in the Pioneer Museum and was climaxed by a very interesting explanation and description of "The Sinbad's Valley and Elsie dyke localities" by Frank Ellis Brown, geologist and mining engineer.

The July 17 business session was followed by a talk by Gertrude Walcher, secretary-treasurer of the Society, on "diamond." Mrs. Walcher is much interested in gems and presented a very interesting and informative explanation of gems and particularly of the diamond.

The July 21 field trip with the Colorado Mineral Society (of Denver) to the Tarryall topaz locality was well attended by both societies. A beautiful day and quite a number of topaz specimens were found.

On Aug. 28, the museum committee reported that the museum collection now contains over one hundred specimens and will be on display by the end of the week. O. A. Reese furnished the program with a manuscript of historical nature on "Mount Mica Tourmaline Locality and Crystals" and by showing colored pictures of a part of his crystals and crystal cluster collection, also colored pictures taken on his trips to Mexico in search of optical calcite; he was assisted by Clarence Coil in showing the pictures.

All above meetings were well attended and several new members admitted to the Society.

J. P. Osborn, President

East Bay Mineral Society

A regular meeting of the Society was held on Sept. 19, 1946. in the Auditorium Lincoln School, in Oakland, Calif. The speaker was Francis J. Sperisen.

Boston Mineral Club

A regular meeting of the Club was held on Sept. 10, 1946, at the American Academy of Arts and Sciences, Boston, Mass. The program was devoted to summer collecting news.

Rock Show Held at Bayfield, Colo.

On Sept, 7 & 8, 1946, a local Rock Show was held in Gem Village, Bayfield, Colo. It was a swell affair, 14 exhibitors and over 200 being present. Weather perfect. All bought, sold, or traded "rocks."

New Jersey Mineralogical Society

A regular meeting of the Society was held on Sept. 10, 1946, at the Public Library, in Plainfield, N. J. The speaker was Robert M. Hutchinson whose subject was a good geological background for mineral collecting in New Jersey.

American Gem Society

(Northern Ohio Guild)

A regular meeting of the Guild was held on Sept. 10, 1946, at Western Reserve University, Cleveland, Ohio. The program consisted of a lecture on "Corundum—Sapphires and Rubies, by Dr. Henry F. Donner, of the University.

Newark Mineralogical Society

The 242nd meeting of the Society was held on Oct. 6, 1946, in the Newark Museum, Newark, N. J. The program consisted of a symposium on summer collecting.

Los Angeles Mineralogical Society

Mr. Roy Bailey, Chemist for the American Potash and Chemical Co., gave the Society some interesting highlights on Searles Lake minerals at its Aug. 15, 1946, meeting. Mr. Bailey stated that late core borings in the lake have changed speculation as to the probable formation of this vast layer of minerals in one region. The probability is that this region at one time was covered by a vast lake extending from Owens Valley to Black Wells and at times spilling over into the Panamint area. Core boring showed alternate layers of minerals and black slimy mud extending down for hundreds of feet. Speculative reasoning places the age of the area anywhere from 25,000 to 50,000 years. Almost every water and carbonic soluable mineral in existance is found in the deposit, though hanksite, tincal, glaserite, gaylusite, gypsum, realgar, pearlzite, halite, trona and boracite are some of the predominating minerals. Many of the deposits show fluorescent and phosphorescent properties.

A. G. Weigel
Pub. Chm.

Mineralogical Society of Southern California

The first regular meeting for the 1946-7 season was held on Sept. 9, 1946, at the Pasadena Public Library, Pasadena, Calif. The main feature was an authentic and informative sound motion picture story of wrought iron—its history from ancient times —the development of its processes of manufacture—its physical properties—its fabrication and uses.

Marquette Geologists Association

The first meeting of the Association, for the 1946-47 season, was held on Sept 7th. The usual crowd was available, for this interesting meeting, led by Langdon Longwell, the new President.

Gil Rudiger made an interesting and informative talk on the trip he took during the summer, with his wife. Collecting was done along some of the Oregon Agate beaches, as well as in the Eden Valley locality, and Wyoming in general. Gil reported good collecting, and promises a colorfull display, sometime this fall, when he can get the material in shape.

Tom Scanlon had some nice specimens on display, which he had collected on the Keweenaw Peninsula, during his vacation. He gave the members present, the location of his finds.

Langdon Longwell was also very informative, as to the location of some large pieces of Agate, on the Keweenaw Peninsula. The only drawback appears to be the location of some large black bears, in the same locality.

Ken Russell, the Thomsonite man, had a striking display of Thomsonite, which he had collected and polished, during the summer.

Meetings of the Marquette Geologists Association, are held monthly, the first Saturday, at The Chicago Academy of Sciences, at 8:00 P.M. Visitors are always welcome.

O. A. Swanberg

Los Angeles Lapidary Society

The Los Angeles Lapidary Society held their regular monthly meeting on the second Monday in September, as the first Monday was a legal holiday.

Victor M. Arciniega, member of the American Institute of Mining and Metallurgical Engineers, and instructor of Mineralogy, Geology and Chemistry in the Evening School of Manual Arts High School, Los Angeles, gave a talk on Minerals of Arizona, with emphasis on gem materials.

A most enjoyable and instructive field trip was taken to the home of Jim and Gertrude Forbes of Lnywood, on Sunday, Aug. 18, 1946.

Everyone ate their lunches in the patio surrounded by beautiful examples of a combination of lapidary art and stone masonry. Lovely slabs, hollow geodes, thundereggs and many unusual specimens are cemented in the walls around the patio and yard.

We learned much in watching the lapidary equipment in operation as Mr. Forbes has made and reconstructed most of his machines. The mud saw is so large it has a room to itself.

Such trips as these are the binding agent that holds our membership together and makes us the largest lapidary society in the world.

E. Grace Peters,
(publicity chairman).

Monterey Bay Mineral Society

The following are a few notes from our August 12th meeting: Mr. Robert Deitrich of the East Bay Mineral Society spoke on "MINERALS AND THEIR IDENTIFICATION." He gave an oustanding talk and augmented it with beautiful display specimens which he passed among the group. After his talk he gave an excellent demonstration of tests by panning, blow-torch and so on for the identification of minerals.

Mr. Paul Lawrence, President of the Y.M.C.A. Board, installed the following officers for 1946-47:

Pres.-T. G. Emmons, Salinas
V. Pres.-A. W. Flippin, Salinas
Treas.-Alice R. Everett, Santa Cruz
Advisor-Past Pres. Wm. O. Eddy, Salinas
Directors-H. Samuelson, Salinas
R. L. Dey "
D. E. Perry "

Chicago Rocks and Minerals Society

A regular meeting of the society was held on Sept. 10th, 1946, at its headquaters in the Sauganash Park Field House 5861 N. Kostner ave., Chicago, Ill. The speaker of the evening was Mr. Smithson, a student of Atomic Science for many years,

The lapidary shop of the Society, which is open every Monday and Friday evening, has been a beehive of activity in spite of the great heat. A number of field trips of various groups of the Society have been taken.

Geo. C. Anderson
President

Pacific Mineral Society

A dinner meeting of the Society was held on Sept.13th, 1946, at Scully's Restaurant, in Los Angeles, Calif. The speaker was Mrs. Alwilda Dartt, whose subject was "My trip to Old Mexico."

Minnesota Mineral Club

A two day field trip was held by the Club on Sept. 7 & 8, 1946, to the North Shore of Lake Superior, where along the beaches beautiful agates, thomsonites and other minerals are found.

TORQUOISE

(Continued from page 670)

the American Museum of Natural History of New York City. It was during this expedition that Morris found upon the breast of a skeleton a pendant consisting of a ring of hardwood 3¼ inches across, bearing 81 pieces of turquoise set on the wood with gum.

It was the desire of the ancient craftsmen as with the modern, to turn out work that will be treasured throughout all time regardless whose eyes will behold it. And so with us who collect the turquoise art of the Indian, we see and acknowledge the craftsmen's desire.

. . . With Our Dealers . . .

Beautiful old and rare Michigan coppers and other minerals are advertised by E. W. Martin, of Ann Arbor, Mich.

The Western Trader, of Saramento, Calif., offers for this month some nice slabs of opalized and agatized woods.

Jewelry making and repairing taught at home—offered by the Gemcrafters of Kalispell, Mont., a new advertiser.

A study collection of rare metallic ores can be obtained from John S. Albanese, of Newark, N. J.

The Gem Exchange, formerly of Lake Bluff, Ill., are now located in Bayfield, Colo. Note the faceting device featured by them.

The Desert Rat's Nest, of Encinetas Calif., specializes in facet and fine cabochon gems.

Use Mineralight for pleasure, for beauty, for research, for profit—advises its manufacturer, the Ultra-Violet Products, Inc., of Los Angeles, Calif.

Jack Frost, of Banning, Calif., has some bargain bundles of good mixed cutting material.

All kinds of lapidary equipment and supplies can be had at Grieger's Pasadena, Calif.

Han Anderson, of St. George, Utah, has some beautiful malachite and azurite specimens from the famous Apex mine.

Herbert Sussbach, of New York City, is offering a surprise package of diamond saws.

Want a nice Wisconsin marcasite? The Geminlap Mart of Milwaukee, Wisc., can supply it.

Henry L. Luoma, Mgr. of the Keweenaw Agate Shop, of Ahmeek, Mich., is quite ill so if any delay takes place in the filling of your order you will understand why.

An aircraft gunsight for viewing small specimens—also binocular loupes—can be purchased from Lloyd M. Demrick, of San Francisco, Calif.

Fred Roberts, Jr., of Monterey Park, Calif., announces that he has a large new stock of cabinet specimens, cutting material, fluorescent material, lapidary supplies, etc.

Universal Minerals, of Los Angele, Calif., is a new advertiser. Note their offerings!

Crystallized azurite from Copper Basin, Ariz., can be had from the Mineral Foundation, of Tucson, Ariz.

A simple, sturdy, heavy duty machine for various shaping of cabochons is the Cone Lap, so state the Mountain Gem & Supply Co., of Durango, Colo.

Hand-made sterling silver jewelry can be obtained from the Thunderbird Gem Shop, of Claypool, Ariz., a new advertiser.

Fine cutting material from new fields is featured by L. O. Goodman, of New York City, another new advertiser.

Do San Diego Co., Calif., gem materials interest you? The Mission Mineral Mart, of San Diego, Calif., have some nice ones in stock.

Exquisite flowered and plumed agate may be obtained from Frank Duncan and Daughter, of Terlingua, Texas.

Collector's items, including some superb Bisbee azurites, are available at Ward's Natural Science Est., Rochester, N. Y.

Inexpensive curious minerals are featured this month by Schortmann's Minerals, of Easthampton, Mass. Don't just be curious—order some!!!

The 6th list of fine minerals from an old collection is released this month by Hugh A. Ford, of New York City.

Mineral & Gem Dealers, of Asheville, N. C., have some October specials. Look them up!

Another new advertiser is Keithley Bros., of Denver, Colo. See their ad.

Want any Idaho gem minerals? The Lay-Art Gem Shop, of Boise, Idaho, can supply them.

E. A. Baust, manufacturing jeweler of Eureka, Calif., can furnish mountings in gold, palladium, and platinum for all types of stones.

A. G. Parser, Inc., of New York City, have received a large shipment of Congo malachite.

Graffham's Commercial Museum, of Ottawa, Kans., and the Omaha Scientific Supply Co., of Omaha, Nebr., have merged their businesses under the name of Western Geological Supply Co. Their address is Box 1750, Omaha 4, Nebr.

Some imported gem rough minerals are advertised by Lionel Day, of New York City.

New wholesale prices on ear wires are announced by Neuwerk Lapidary Shop, of Moline. Ill.

Note the fine minerals featured in the 4 ads of the Wiener Mineral Co., of Tucson, Ariz.

Interesting vanadium-uranium minerals can be obtained from Atomic Bomb Uranium Specimens Co., of Denver, Colo., (a new advertiser).

Six interesting minerals from Western United States and Mexico are featured by Burminco, of Monrovia, Calif.

Mineral bargains for the student or beginner, or for an advanced collector's reference collection, may be had from Hatfield Goudey, of Yerington, Nev.

James Mering of Goldfield, Nev., who was discharged last February from the U. S. Army, has opend up a mineral shop under the name of Hermitage Lapidary Products. He will handle Nevada gems and minerals in preference to others, and also hand-made Western style jewelry. Mr. Mering is a member of the R.&M.A.

If you need any Arizona agates, jaspers, or petrified wood in gem quality—get in touch with Chas. E. Hill, of Phoenix, Ariz.

Need any fine coppers or silvers from Michigan? Wm. E. Luoma, of Calumet, Mich., has them.

Free gold in quartz is one interesting mineral featured by Stewart W. Hurlbut, of Salmon, Idaho.

A most beautiful and remarkable agate has been found in Colorado by W. C. Eyles and Oscar Gisler. It is for sale by the Pan-American Mining Co., of Bayfield, Colo.

BIBLIOGRAPHICAL NOTES

Fifty-First Annual Report of the Ontario Department of Mines.

Contains four papers. Statistical Review of the Mining Industry of Ontario for 1941 (pp.1-48); List of mines, Quarries, and Works, 1941 (pp.49-63); Mines of Ontario in 1941 (pp.64-236); Mining Accidents in 1941 (pp.237-248).

Fifty-Third Annual Report of the Ontario Department of Mines.

Contains two papers: Geology of the Mattawan-Olrig Area, by W. D. Harding (pp.1-47);The Brazeau Vanadium-bearing Magnetite Deposit, Papineau Township, by W. D. Harding (pp.48-51).

Both of these reports have just been issued by the Ontario Department of Mines, Toronto 2, Ont., Canada.

Publications on the Geology and Mineral Resources of Virginia. By Arthur Bevan.

A six-page circular listing bulletins, circulars, and maps that are available.

Issued by the Virginia Geological Survey, Box 1428, University, Va.

Bibliography of the Geology of Missouri. By Darling K. Greger.

This is the fourth and most complete bibliography on the geology of Missouri. Its contents are as follows: Introduction (p.6); Abbreviations (p.8); Bibliography (by authors, alphabetically, pp.10-185); Counties of Missouri—their Geology (pp.189-207); Economic Geology, Mining and Metallurgy (pp.208-223); Mineralogy (pp.224-232); Petrology and Petrography (pp.233-234); Stratigraphy (pp.235-268); Paleontology (pp.269-277); Physiography (pp.278-281); Structural Geology (pp. 282-283); Geological Maps of all parts of Missouri (pp.284-290); Miscellaneous Subjects (pp.291-294).

This cloth bound volume of 294 pages has Physiography (pp.278-281); Structured Geo-Survey and Water Resources, Rolla, Mo.

Desert Ripples. By Ronald L. Ives.

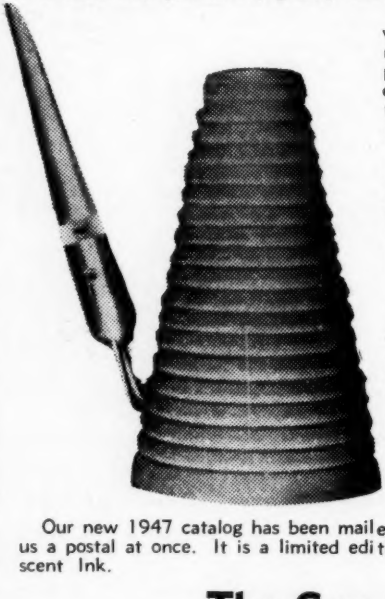
An interesting paper by the Vice-President of the R.&M.A. It covers observations made by Mr. Ives during the progress of field work in western United States from 1928 up to 1946.

Desert ripples are relatively large, slightly arcuate, arranged very roughly in echelon, with crests supporting vegetation and troughs plated with caliche; they cover several thousand square miles of desert land. Physical structure and probable origin of the ripples are outlined in the paper.

Printed in the *American Journal of Science,* Vol.244, July, 1946, pp.492-501 (New Haven, Conn.).

Dr. Willem's Faceting Device

The War stopped the manufacture of this splendid tool, fully described in all editions of Dake's **"Art of Gem Cutting,** and Howard's **Lapidary Handbook.** Now it is back into production, greatly improved in design and workmanship.



The jamb peg method is used by the world's professionals and the finest stones now turned out by amateurs, use this principle. If you wish to avoid the years of apprenticeship and in a short time cut the finest of gems, Dr. Willems Device offers the way.

Developed by a noted surgeon, who has won national fame for superb faceted gems, it is a simple direct method using an inexpensive tool. It opens to the amateur, without mechanical restriction as to size or shape, the facinating field of faceting gem stones.

The Device can be quickly slipped on ½ inch stanrod of the Gilde Gem Cutter, or fitted to any horizontal lap.

The Dr. Willems Faceting Device consists of wooden jamb, aluminum peg with correction ring, two adaptors for small or large stone, and full instructions. Outfit postpaid for **$15.00**
½ inch stanrod to fit any lap **$4.00**

We are exclusive agents for this Device and offer liberal discount to dealers, or in lots of six or more Outfits.

Our new 1947 catalog has been mailed. If you haven't received a copy, drop us a postal at once. It is a limited edition, and uses the wonderful new Fluorescent Ink.

The Gem Exchange

(Gem Village)

Bayfield, Colorado

NOW AVAILABLE FROM YOUR DEALER

A stone gage in standard jewelry millimeter ring sizes

3 calibre sizes for stones in cluster rings 2 x 3, 3 x 4, and 4 x 5 mm.

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